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SOUND LEVEL METER 2218

BRUEL & KJAER

DOUGLAS AIRCRAFT COMPANY

MCDONNELL DOUGLAS CORPORATION

Brüel & Kjær

Precision Integrating Sound Level Meter

Type 2218

Valid from serial no. 829163

037—0303

Service

Precision Integrating Sound Level Meter

Type 2218

Valid from serial no. 829163

037—0303

No 225309

Consisting of:

	page	date
Service Instruction	0—1	8.79
- -	0—2	8.79
- -	0—3	8.79
Checking Procedure	1—1	8.79
- -	1—2	8.79
Power Supply	2—1	2.78
Amplifier and Weighting Circuit	3—1	2.78
LMS and Meter Circuit	4—1	2.78
- - - -	4—2	2.78
- - - -	4—3	2.78
Leq and Display Circuit	5—1	8.79
- - - -	5—2	2.78
- - - -	5—3	8.79
OZ 0027 Selector Board	1	2.78
OZ 0028 Selector Board	1	2.78
ZC 0007 Input Stage	1	8.79
ZD 0183 Display Board	1	2.78
ZE 0235 Amplifier Board	1	2.78
ZL 0056 Detector Board	1	1.79
	2	1.79
ZZ 0054 Leq and Power Supply	1	8.79
	2	8.79
Mechanical Parts	6—1	2.78
Parts List and Block Diagram	7—1	8.79

Spare Parts

Please state type and serial number of the instrument when ordering spare parts.

Trouble Shooting

If any fault should occur, check the instrument according to the Checking Procedure.

The Checking Procedure is divided up into sections, where each section will refer to a subsection in the Service Instruction corresponding to a specific part of the instrument.

The subsection in the Service Instruction will normally consist of a Block Diagram, a Technical Description, an Adjustment Procedure and a Simplified Diagram where the test points are identified.

Before correction any apparent deviation make sure that the measuring instrument has tolerances small enough not to affect the measurement.

When a fault has been traced and corrected, the voltages and adjustments influenced by the correction must be rechecked. The complete instrument should then be tested to make sure that all basic functions are operative.

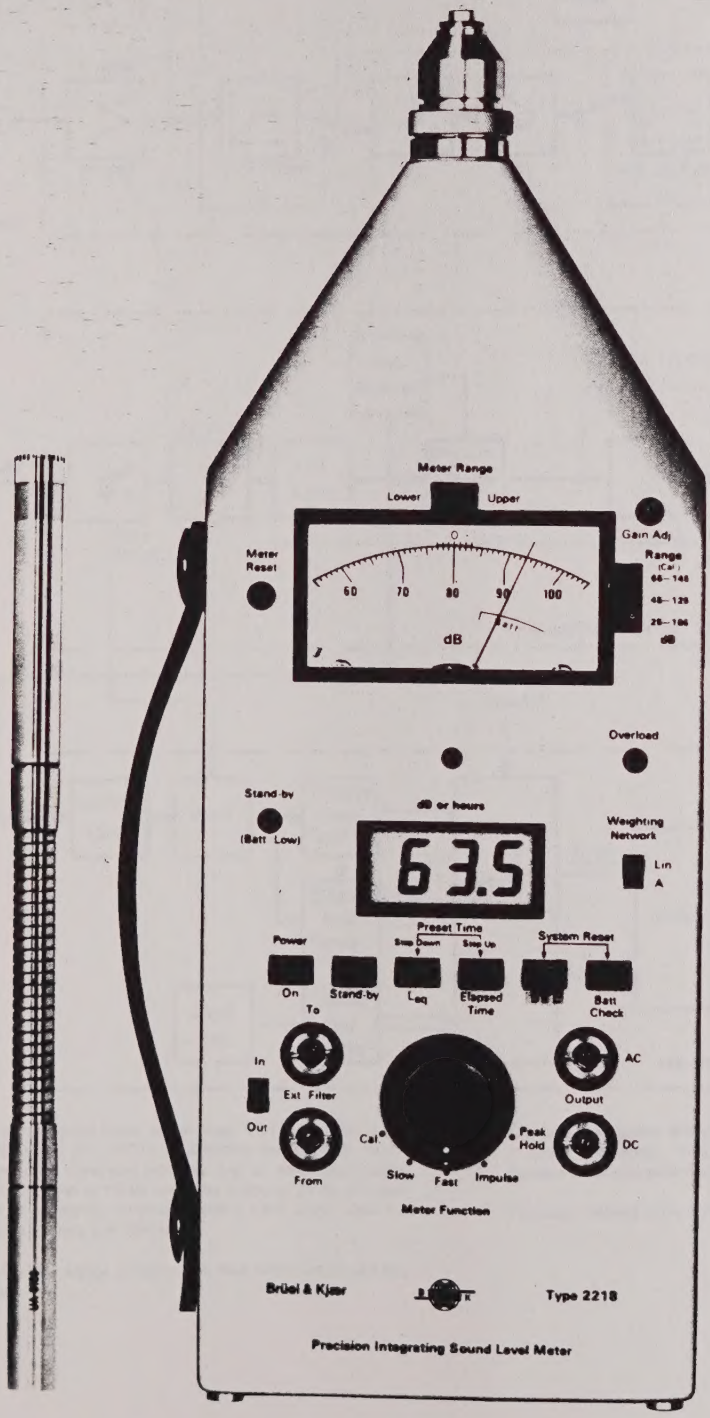
The tolerances given in these notes are intended for use as guide for adjustments.

Updating

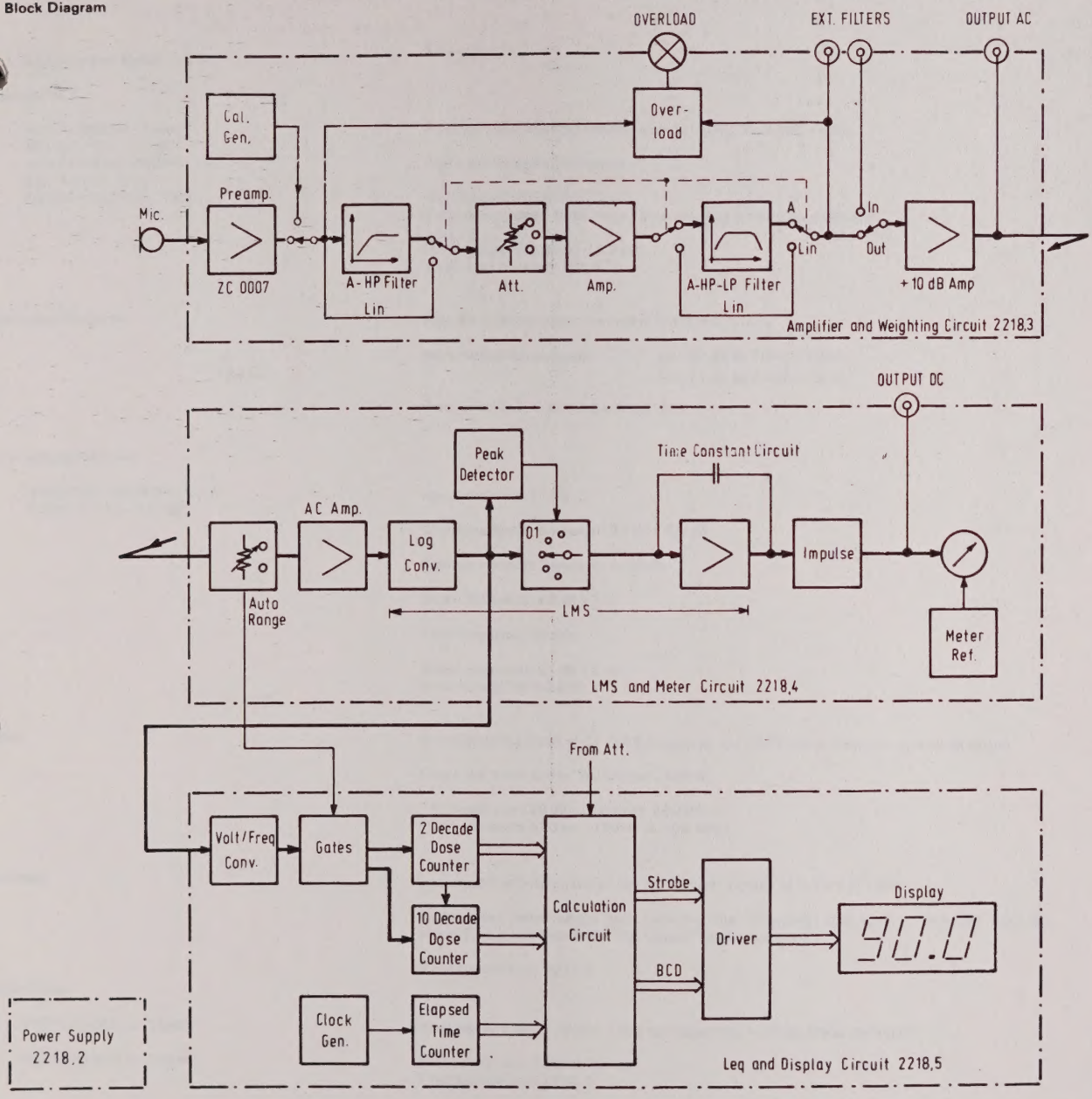
Due to the constant progress in technology the instrument will from time to time be brought up to date in order to provide continuously improved performance.

For this reason there may be small variations between the instrument and the Service Instruction.

However, the local Service Representative is in possession of all informations regarding any change that has been made.


Meter Range
Lower
Upper
Gain Adj
Meter Reset
Range
60
70
80
90
100
dB
Overload
Stand-by
(Batt Low)
dB or hours
63.5
Weighting Network
Lin
A
Preset Time
Step Down
Step Up
System Reset
Power
On
Stand-by
Leq
Elapsed Time
Batt Check
To
In
Ext Filter
Out
From
AC
Output
DC
Cal
Peak Hold
Slow
Fast
Impulse
Meter Function
Brüel & Kjær
Type 2218
Precision Integrating Sound Level Meter

Block Diagram



The Precision Integrating Sound Level Meter Type 2218 contains a removeable Preamplifier stage (ZC 0007), an amplifier section with an A-weighting Filter, Attenuator, Overload Indicator and in- and output sockets for an external filter. Next a 10 dB Amplifier followed by an AC output socket. Then an Autoranging Attenuator and a LMS circuit with a DC Output socket and a Moving Coil Meter.

From the Log Converter the signal is fed to the Peak Hold circuit and the Leq Calculation circuit.

The Leq Calculation circuit consists of a Voltage to Frequency Converter, a Clock Generator, Counters and Calculation Circuit for Dose and Elapsed Time measurements.

The Leq, Elapsed Time and SEL is displayed on a Liquied Crystal Display.

1.1. Ampli

Sensitivity

METE
RANG
WEIG
EXT.
METE

Frequency

A-Weightin

WEIG
RANG

Noise

Overload

Meter Rang

METEF

METEF

Peak Hold

8.79

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1 Amplifier and Meter Circuit

Sensitivity

METER RANGE: "Lower"
RANGE: "65—145 dB"
WEIGHTING NETWORK: "Lin"
EXT. FILTER: "Out"
METER FUNCTION: "Fast"

Input signal through an adaptor type JJ 2615: 31,6 mV, 1 kHz

Check the following voltages:

"AC Output": 5,8 mV ± 0,2 mV
If necessary adjust GAIN on the front panel or consult item 2218.3

Meter deflection: 90 dB ± 0,2 dB.
If not consult item 2218.4

Frequency Response

Vary the input frequency between 10 Hz and 20 kHz.

Meter deflection between: 89—91 dB at 20 Hz—20 kHz
87—91 dB at 10 Hz—20 Hz

If not consult item 2218.3 and 2218.4

A-Weighting Network

WEIGHTING NETWORK to "A"
RANGE to "45—125 dB"

Input frequency 1 kHz.

Check the Meter deflection: 90 dB ± 0,2 dB

Change the input frequency to 50 Hz.

Meter deflection: 59 dB ± 2 dB.

Input frequency 20 kHz.

Meter deflection: 81 dB ± 2 dB.
If not consult item 2218.3.

Noise

Shortcircuit the input of JJ 2615 to ground. (JJ 2615 has an internal capacity of 50 pF)

Check the noise at the "AC Output" socket.

"A" maximum 120 μV (10 Hz to 200 kHz.)
"Lin" maximum 180 μV (10 Hz to 200 kHz.)

Overload

Input signal corresponding to an "AC Output" voltage of 3,16 V at 1 kHz.

Increase the input voltage and check that the "Overload" LED lights up between + 0,5 dB above 3,16 V, and before the "AC Output" signal is clipped.

If not consult item 2218.3.

Meter Range

METER RANGE to "Upper"

Input signal approx. 10 mV, 1 kHz corresponding to 80 dB Meter deflection.

METER RANGE to "Lower"

Meter deflection: 80 dB ± 0,1 dB.
If not consult item 2218.4.

Peak Hold

Input signal corresponding to 80 dB Meter deflection.

Turn METER FUNCTION to "Peak Hold"
Activate METER RESET.
Meter deflection: 83,5 dB ± 0,5 dB.

Remove the input signal and check the decay time: < 0,5 dB in 10 s.
If not consult item 2218.4.

continued

1.2. Leq Calculation Circuit

L_{eq}

METER RANGE: "Lower"
RANGE: "65—145 dB"
WEIGHTING NETWORK: "Lin"
EXT. FILTER: "Out"
METER FUNCTION: "Fast"

Input signal 1 kHz through an adaptor Type JJ 2615 corresponding to a Meter deflection of 90 dB.

Activate SYSTEM RESET.

Display reading: 90,0 dB ± 0,2 dB. (After 1 min.)

Preset Time

Preset the time to .010 and check that the instrument goes to "Stand by" when the Display reach .010.

Elapsed Time

Press SYSTEM RESET, check the time between the "Stand by" turns Off and On: 36 s ± 1 s.

Activate SYSTEM RESET and check that the Display shows P——.
If not consult item 2218.5.

SEL

Input signal corresponding to 90 dB Meter deflection.

Preset the time to .010.
Activate SYSTEM RESET and wait until the "Stand by" lights up.
Note the L_{eq} reading at the Display.
Activate STANDBY and then SEL.

Check that the Display reading increases by 15,6 dB ± 0,2 dB.
If not consult item 2218.5.

Keep-Alive Battery

RANGE to "25-105 dB"
METER FUNCTION to "Cal."

Make an L_{eq} measurement (30 s) and activate STAND BY
Note the Display reading.

Slowly remove the instrument battery cover until the Display reading disappears.

Push the battery cover back in place.
The reading should now appear again and have the same value as noted ± 0,1 dB.

If the readings differ more than ± 0,1 dB the Keep-Alive Battery should be exchanged.

1.3. Calibration

METER RANGE: "Lower"
RANGE: "65—145 dB"
WEIGHTING NETWORK: "Lin"
EXT. FILTER: "Out"
METER FUNCTION: "Cal."

Mount the Flexible Extention Rod UA 0196 and the Microphone Type 4165.

Activate SYSTEM RESET in order to select the lower auto attenuator range

Adjust the GAIN ADJ. to the correct microphone K-factor.

METER FUNCTION to "Fast"

Check by means of a Sound Level Calibrator, Pistonphone Type 4220, that the calibration is within ± 0,2 dB.

If not consult item 2218.3.

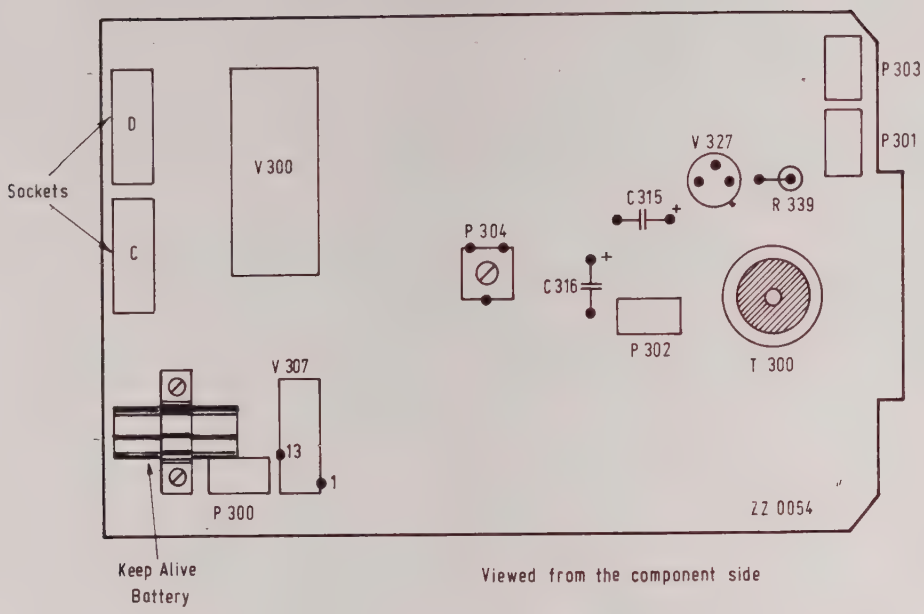
75,5 V adjustm

± 7,2 V adjustm

Ext. Supply

200 V Pol. volta

Stabilizer and "



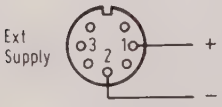
Viewed from the component side

75,5 V adjustment

Measure the voltage at the emitter of V327: 75,5 V ± 1 V
If necessary adjust P302.

When adjusting, the Battery voltage should be 4,5 V. (Ext. Power Supply)
The current consumption will then be approx. 200 mA.

±7,2 V adjustment



Check the voltages at socket C, refer to the picture above:

C7: + 7200 mV ± 10 mV

C10: —7200 mV ± 10 mV

If necessary adjust P303.

The voltage across the capacitors C315 and C316 should be between 8,4 V and 8,7 V.

200 V Pol. voltage adjustment

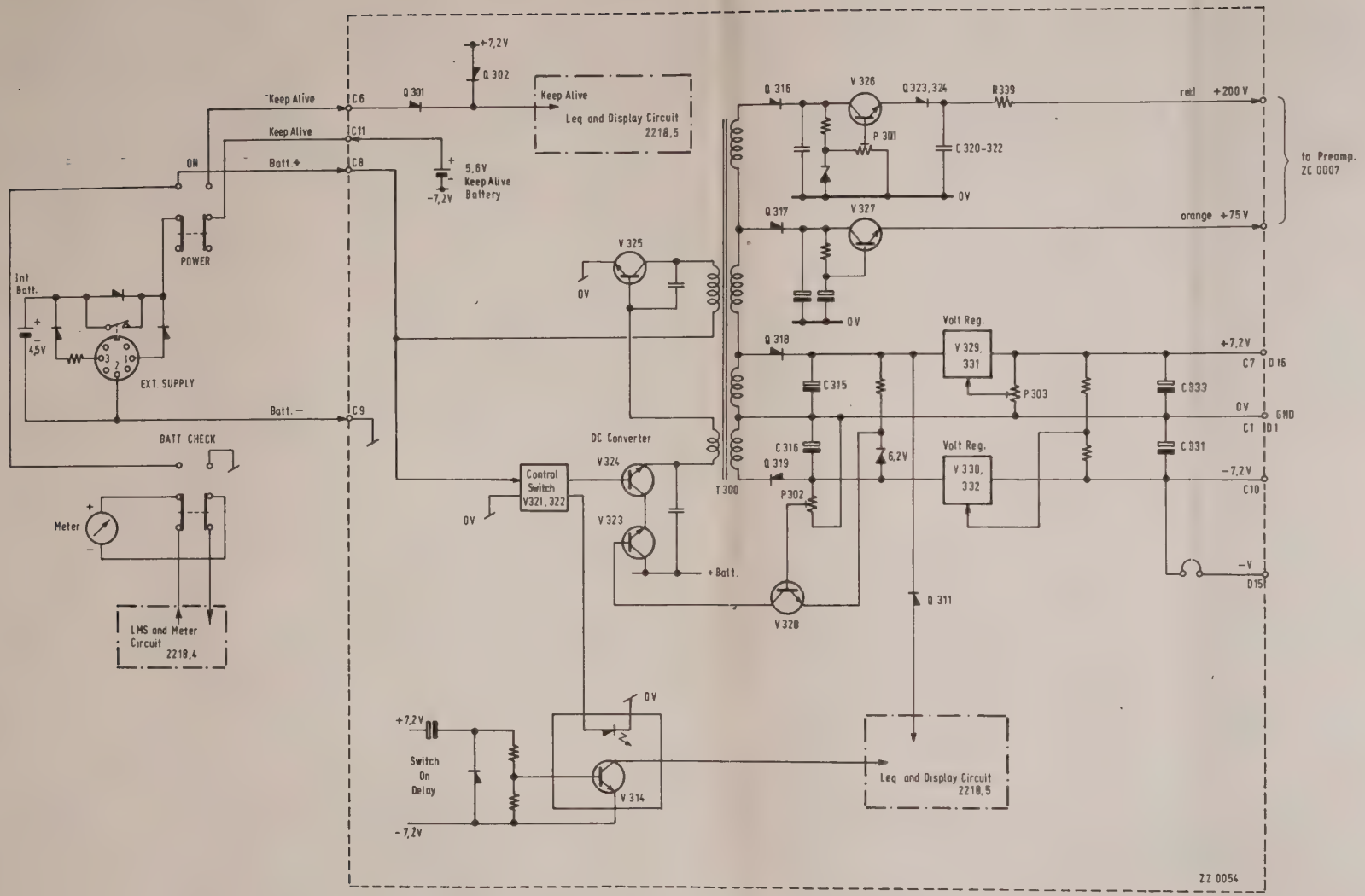
Check the voltage on R339: 200 V ± 1 V.
Use a high impedance DC Voltmeter. > 100 MΩ.

If necessary adjust P301.

Stabilizer and "Batt. Low" check

Vary the Battery voltage between 7,5 V and 3,8 V.
Check that the 7,2 V does not change more than 2 mV.
Check that the 200 V Pol. voltage does not change more than 0,4 V.

Check that the Converter stops when the Battery voltage are within 3,2 V and 3,8 V


+7,2V
Q 302
Keep Alive
Q 301
Keep Alive
Leq and Display Circuit
2218,5
Keep Alive
C 6
C 11
Batt.+
C 8
ON
POWER
5,6V
Keep Alive
Battery
-7,2V
Int.
Batt.
4,5V
EXT. SUPPLY
Batt.-
C 9
BATT CHECK
Meter
LMS and Meter
Circuit
2218,4
V 325
0V
DC Converter
V 324
V 323
Control
Switch
V321, 322
0V
+Batt.
T 300
Q 316
V 326
Q 323, 324
R 339
red +200 V
P 301
C 320-322
0V
to Preamp.
ZC 0007
Q 317
V 327
orange +75 V
0V
Volt Reg.
Q 318
V 329,
331
+7,2V
C7 D16
C 315
P 303
C 333
0V
GND
C1 D1
C 316
Q 319
6,2V
Volt Reg.
V 330,
332
C 331
-7,2V
C10
P302
-V
D15
V 328
Q 311
0V
+7,2V
Switch
On
Delay
V 314
-7,2V
Leq and Display Circuit
2218,5
ZZ 0054

Shooting

t.

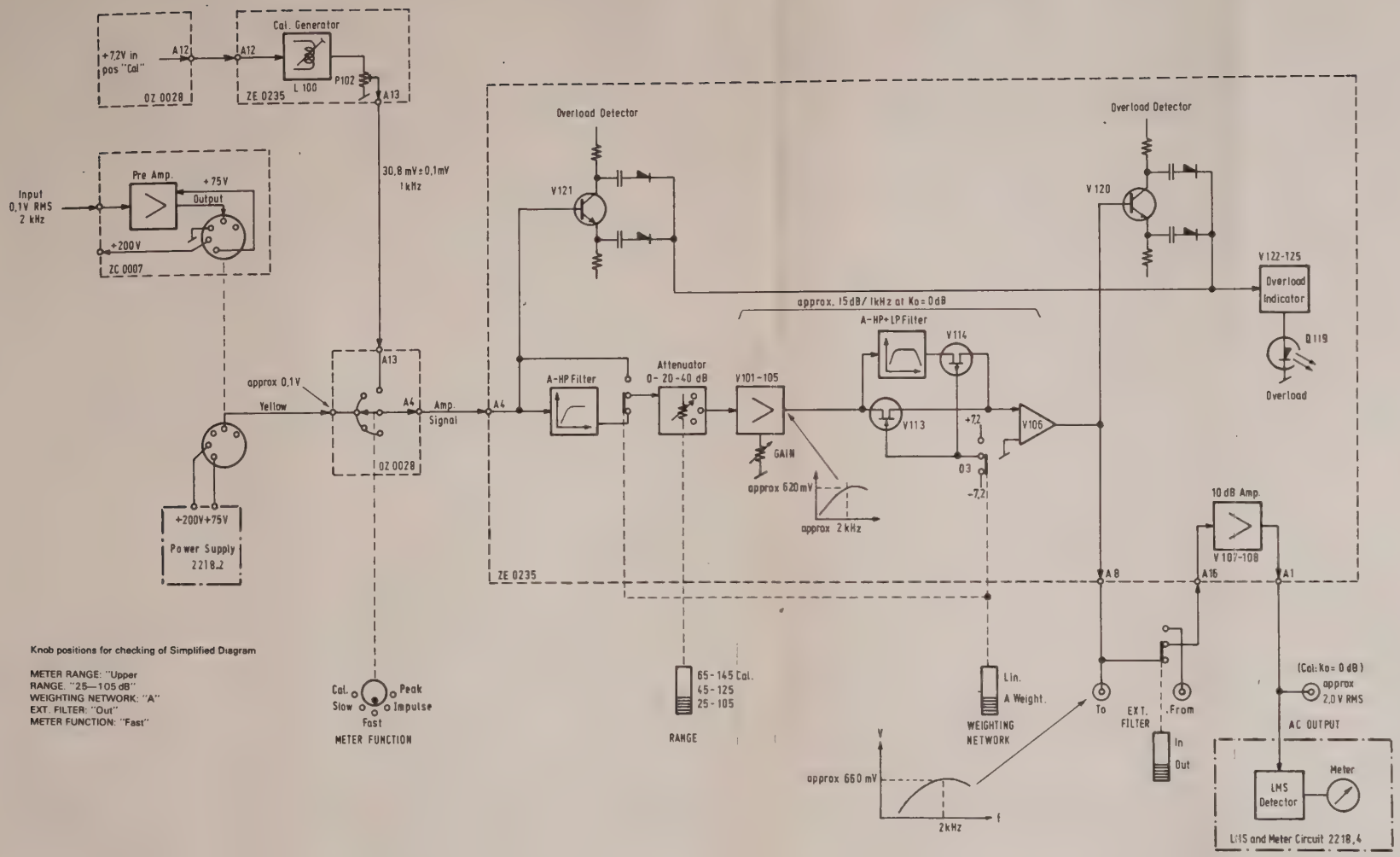
Check the signals shown on the Simplified Diagram in order to locate the defective circuit.
Then use the original diagram ZE 0235 to find the defective component.

Calibration Generator

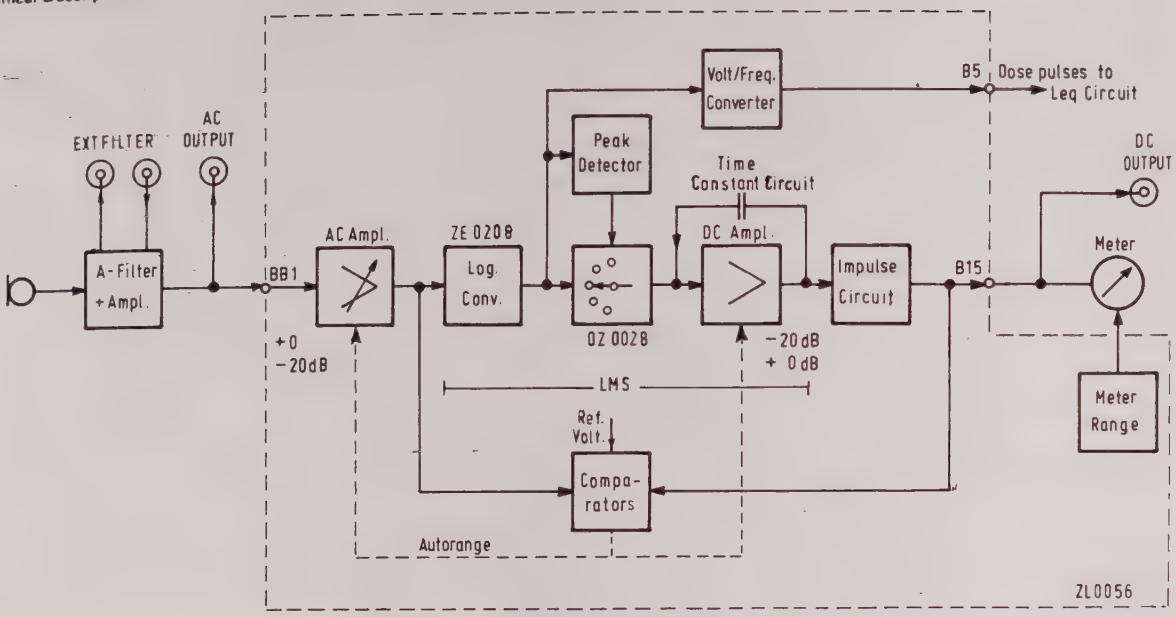
METER RANGE: "Upper"
RANGE: "25—105 dB"
WEIGHTING NETWORK: "Lin"
EXT FILTER: "Out"
METER FUNCTION: "Cal."

Check the frequency at the "AC Output": 1 kHz ± 10 Hz
If necessary adjust L 100.

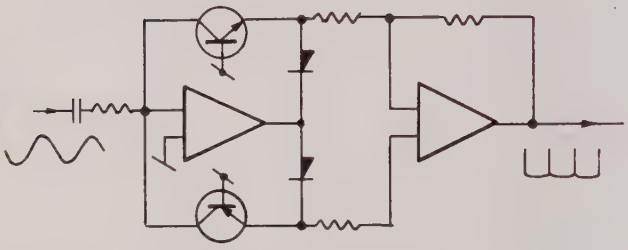
Check the voltage at the center pin of P 102: 30,8 mV ± 0,1 mV.
If necessary adjust P 102.


+7,2V in pos "Cal"
A12
OZ 0028
Cal. Generator
A12
L 100
P102
A13
ZE 0235
30,8 mV ± 0,1mV 1 kHz
Input 0,1V RMS 2 kHz
Pre Amp.
+75V
Output
+200V
ZC 0007
A13
approx 0,1V
Yellow
A4
Amp. Signal
OZ 0028
+200V+75V
Power Supply 2218.2
Overload Detector
V121
A-HP Filter
Attenuator 0- 20-40 dB
V101-105
A4
GAIN
approx 620mV
approx 2kHz
approx. 15dB/ 1kHz at Ko = 0dB
A-HP+LP Filter
V114
V113
+7,2
03
-7,2
V106
Overload Detector
V120
V122-125
Overload Indicator
D119
Overload
10 dB Amp.
V 107-108
A8
A16
A1
ZE 0235
Knob positions for checking of Simplified Diagram
METER RANGE: "Upper"
RANGE: "25—105 dB"
WEIGHTING NETWORK: "A"
EXT. FILTER: "Out"
METER FUNCTION: "Fast"
Cal.
Peak
Slow
Impulse
Fast
METER FUNCTION
65-145 Cal.
45-125
25-105
RANGE
Lin.
A Weight.
WEIGHTING NETWORK
V
approx 660 mV
2kHz
f
To
EXT. FILTER
From
In
Out
(Cal: Ko = 0 dB)
approx 2,0 V RMS
AC OUTPUT
Meter
LMS Detector
LMS and Meter Circuit 2218,4

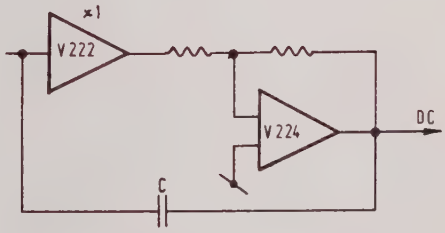
Technical Description



Block Diagram of the LMS and Meter Circuit.



Principle of the Log Converter Circuit ZE 0208



Principle of the Time Constant Circuit

Principle of the LMS Circuit

The input to the LMS and Meter Circuit is BB1. In order to expand the dynamic range of the LMS Circuit an Autorange Amplifier is incorporated in the circuit. (+ 0, —20 dB).

The Autorange Amplifier is controlled by the Comparators V203.
The output of the Impulse Circuit B15 and the output of the Autorange Amplifier is compared to the Reference Voltage. The result governs the gain of the Autorange Amplifier.

The Amplifier is followed by a thick film Log Converter ZE 0208. Pin 25 is the input and pin 4 the output. The output off-set is controlled by the potentiometers P200 and P208. (Refer to the Simplified Diagram.)

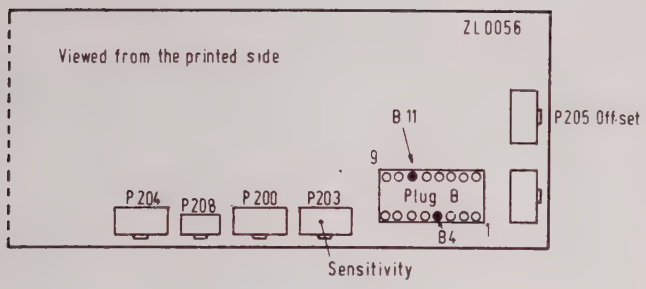
The output is divided into three, one feeding the Voltage to Frequency Converter, one going to the Selector OZ 0028 pin B11 and one going to the Peak Detector. OZ 0028 selects the signal coming directly from the Log. Converter or the signal which has been treated by the Peak Detector.

The logarithmic output from OZ 0028 then goes to the Time Constant Circuit.

The DC output from the Time Constant Circuit feeds the Impulse Circuit which again is controlled by the Selector OZ 0028.

The Meter Range is selected via an amplifier V235 which is controlled by a front panel operated switch.

Adjustment Procedure



Autorange Check

METER RANGE: "Upper"
RANGE: "25—105 dB"
WEIGHTING NETWORK: "Lin"
EXT. FILTER: "In"
METER FUNCTION: "Fast"

Input signal to "From Ext. Filter" corresponding to 3,16 V at "Output AC". (approx. 1 V at 1 kHz).

Check the voltage at pin B4: approx: 7 V.

Remove the input signal and check B4: approx. + 7 V. (After 2 s).

Log-Converter Adjustment

Oscilloscope picture
5 mV/cm - 0,5 ms/cm

By the following adjustments ZZ 0054 can be fully swung out as the connection to ZC 0007 is not longer necessary.

Input signal to "From Ext. Filter" corresponding to 3,16 V at "Output AC". (approx. 1 V, 1 kHz).
Decrease the input signal 30 dB.

Adjust P200 to minimum AC offset (equal amplitude) at pin B11.

Increase the input signal by 30 dB and adjust P208 to equal amplitude (negative). (Oscilloscope 5 mV/cm).

DC Output Adjustment

Input signal corresponding to 3,16 V at "Output AC":(1 kHz.)
Decrease the input signal by 30 dB.

Activate SYSTEM RESET in order to select the lower auto attenuator range.

Check the dynamic range at "Output DC" from —30 dB to —80 dB according to the scheme below.

	Input voltage					
	—30 dB	—40 dB	—50 dB	—60 dB	—70 dB	—80 dB
OUTPUT DC	—2,500 V	—2,000 V	—1,500 V	—1,000 V	—0,500 V	0,000 V

Toleance: ± 10 mV
If necessary adjust P203 Sensitivity and P205 DC off-set.

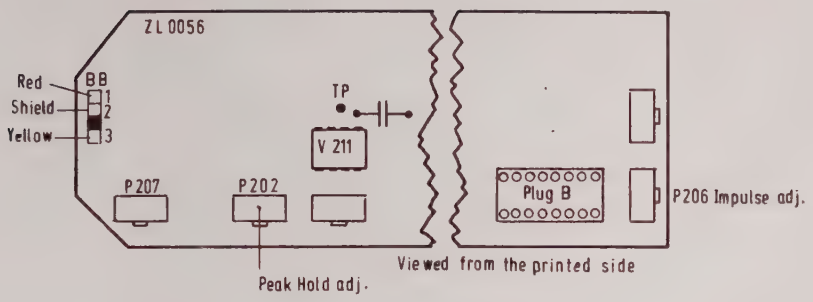
Increase the input signal to 0 dB. (upper att. range)

Check the dynamic range from 0 dB to —50 dB according to the scheme below.

	Input voltage					
	0 dB	—10 dB	—20 dB	—30 dB	—40 dB	—50 dB
OUTPUT DC	—4,000 V	—3,500 V	—3,000 V	—2,500 V	—2,000 V	—1,500 V

Tolerance: ± 10 mV.

If necessary adjust P204.



Meter Range Adjustment

Check the voltage at pin BB3: 1,500 V ± 1 mV.
If necessary adjust P207.

METER RANGE to "Lower" — The voltage at BB3 should now be: 0,000 V ± 3 mV.

Meter Adjustment

POWER: "Off" — Adjust the screw on the front of the meter to mechanical zero on the meter scale.

POWER to "On"
METER RANGE to "Upper"
RANGE to "65—145 dB" — Input signal to "From Ext. Filter" corresponding to 3,5 V DC at "Output DC".
Check the meter deflection: 10 dB below FSD. (135 dB)

If necessary adjust P400 on OZ 0027.

Meter Function Check

METER FUNCTION to "Slow" — Input signal to "From Ext. Filter" corresponding to 3,16 V at "Output AC" (1 kHz.)

Remove the input signal and check that the "Output DC" voltage decreases 3 V in 14 s ± 1 s. (Use an oscilloscope).

METER FUNCTION to "Fast" — Check as above: 3 V in 1,75 s ± 0,15 s.

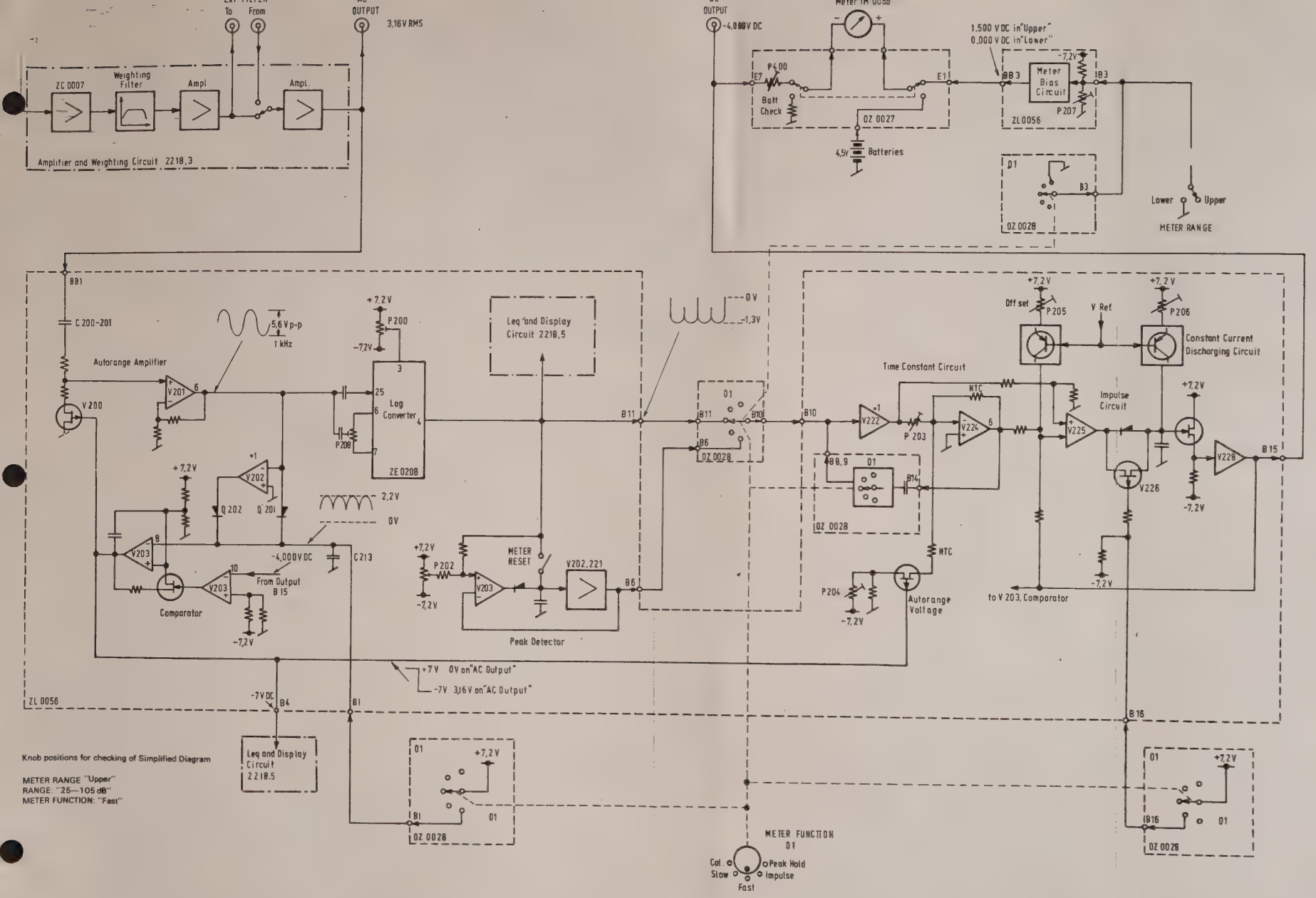
METER FUNCTION to "Impulse" — Check as above: 3 V in 21 s ± 0,5 s.
If necessary adjust P206.

Peak Hold Adjustment

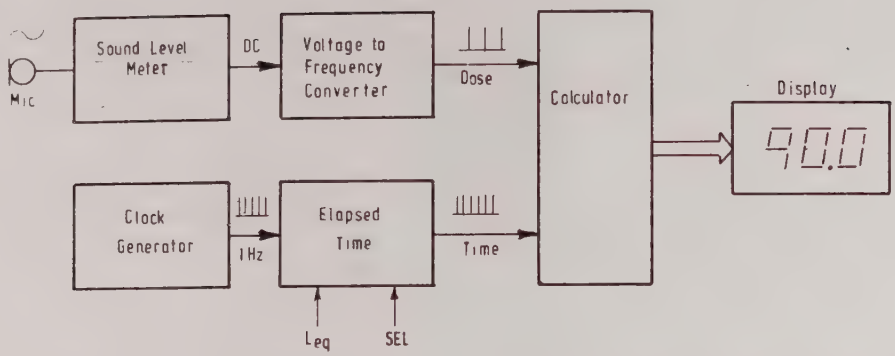
RANGE to "25—105 dB"
METER FUNCTION to "Fast" — Input signal to "From Ext. Filter" adjusted to a meter deflection on the built-in meter, of 90 dB ± 0 dB at 1 kHz.

METER FUNCTION to "Peak Hold" — Activate METER RESET and read the deflection: 93 dB ± 0,5 dB.
If necessary adjust P202.

Remove the input signal.
Check that the meter deflection does not decrease more than 1 dB in 20 s.


To
From
AC OUTPUT
3,16 V RMS
ZC 0007
Weighting Filter
Ampl
Ampl.
Amplifier and Weighting Circuit 2218.3
DC OUTPUT
-4,000 V DC
Meter FM 0058
1.500 V DC in "Upper"
0,000 V DC in "Lower"
P400
E7
E1
Batt Check
OZ 0027
4,5V Batteries
BB3
Meter Bias Circuit
ZL 0056
P207
B3
D1
OZ 0028
Lower
Upper
METER RANGE
BB1
C 200-201
5,6 Vp-p
1 kHz
Autorange Amplifier
V 200
V201
+7,2V
P200
-7,2V
Leq and Display Circuit 2218,5
0V
-1,3V
Log Converter
ZE 0208
P208
B11
B10
B6
V202
Q 202
Q 201
2,2V
V203
C213
-4,000 V DC
From Output B 15
Comparator
P202
METER RESET
V202, 221
Peak Detector
Time Constant Circuit
V222
P 203
V224
NTC
B8,9
B14
P204
Autorange Voltage
Off set
P205
V Ref
P206
Constant Current Discharging Circuit
Impulse Circuit
V225
V226
V228
B15
to V 203, Comparator
+7 V 0V on "AC Output"
-7 V 3,16 V on "AC Output"
-7 V DC
B4
B1
B16
ZL 0056
Knob positions for checking of Simplified Diagram
METER RANGE "Upper"
RANGE: "25—105 dB"
METER FUNCTION: "Fast"
Leq and Display Circuit 2218.5
METER FUNCTION
D1
Cal.
Slow
Fast
Peak Hold
Impulse

Technical Description



The DC Output from the Sound Level Meter is converted into pulses the frequency of which is dependent of the DC value. (Input Sound Level).

This pulses (Dose pulses) is fed to the Calculator

The Clock Generator produce pulses of a frequency of 1 Hz (1 s).

The Calculator now produce a result which is a product of the number of Dose pulses in relation to the measuring time. (Elapsed Time)

The result shown on the Display is the Leq.

The SEL is produced using the same number of Dose pulses but only using 1 s as measuring time instead of the whole measuring periode.

The μProcessor which perform the Leq Calculations has its own internal clock generator running at a frequency of 230 kHz.

Dose Pulses

The Log output of ZE 0208 feeds the Antilog transistor the output of which goes to the Integrator in the Voltage to Frequency Converter. The output of V211 will be a sawtooth due to the capacitor C216. When the sawtooth reach the Reference level the Comparator V203 will change state thus opening the FET V212 and a new sawtooth starts. Every time the Comparator changes state a pulse is fed to the Leq Calculations Circuit

The Noise Dose pulses from the Volt. to Frequency Converter goes to ZZ 0054 via C14. V310 opens for pulses if the battery voltage is within the working range and if the instrument is not in Standby mode. The pulses then goes to the 2 Decade Dose Counters or directly to the 10 Decade Dose Counters. This is selected via V309/3 which again is controlled from the Autorange Circuit. (+ 0—20 dB ZL 0056).

The components V304 and V305 are gate switches between the 2 Decade Dose Counter and the μProcessor. These functions are already built-in to the components V302 and V303. (The 10 Decade Dose Counters are 3-state components).

Time Counter

V301 is the Time Counter used for the Leq calculations. V301 is controlled from the Clock Generator V307 via V309/11 which again only conducts when the instrument is not in Standby mode.

V310 pin 4 and 11 tells the Processor the position of the RANGE attenuator through V306. V306 also tells if "L_{eq}" or "Elapsed time" should be shown on the Display.

Calculator

The μProcessor which perform the L_{eq} Calculations has its own Clock Generator running at a frequency of 230 kHz.
The μProcessor tells the Decade Counters and the Time Counter when the necessary information should be transferred to the Processor.

The calculation can be stopped by the processor when the Elapsed Time reaches the "Preset Time" or if the instrument is set to Standby.

When SYSTEM RESET is activated the Reset Flip Flop resets all the counters. The μProcessor is directly reset by the signal from the RESET push buttons.

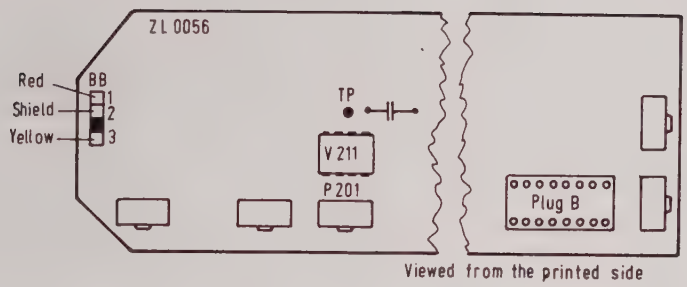
SEL can only be operated in Standby mode. When SEL is activated the Elapsed Time Counter V301 will be reset to zero, but the Decade Dose Counters which contain a certain accumulated information will not be reset. V301 then receive one pulse representing 1s.
The μProcessor now calculate using the informations from the 2 and 10 Decade Counters in respect to 1s and the result is the SEL.

Display

The Display Drive Circuit works as follows: The digits are controlled via the BCD lines D4—7. The Strobe lines D11—14 controlles the multiplexer in the circuit which means that every information is shown one by one on the Display.
The Display repetition frequency of 32 Hz is governed by the Clock Generator V307.

The Display consists of two parts. In the Back plane all the digits and points are connected together and all receive the 32 Hz Display Frequency at the same time. In the Upper plane each information sign receive its information separately. If this information is in phase with the 32 Hz Display Frequency nothing will be seen on the Display, but if the information is 180° out of phase the digits or points will appear at the Display.

Adjustment Procedure



Volt/Frequency Converter

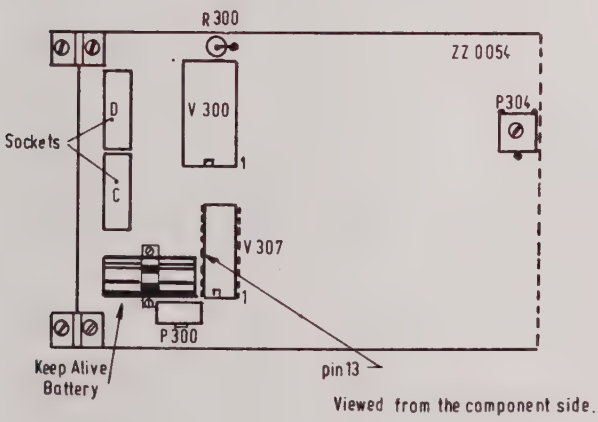
METER RANGE: "Lower"
RANGE: "25—105 dB"
METER FUNCTION: "Fast"

Input signal 1 kHz to "From Ext. Filter" corresponding to 3,16 V, at the "Output AC" socket.

Check the Ramp. Voltage at the test point TP on the output of V211: —0,6 V to + 2,4 V.

Decrease the input voltage 30 dB
Check the average period time at TP: 39,60 ms ± 0,1 ms.

If necessary adjust P201.



Time Generator adjustment

Check the period time of the Clock Generator V307 output pin 13: 31,25 ms ± 30 µs.
If necessary adjust P300
When changing V307 it may be necessary to change value of R302 as well.

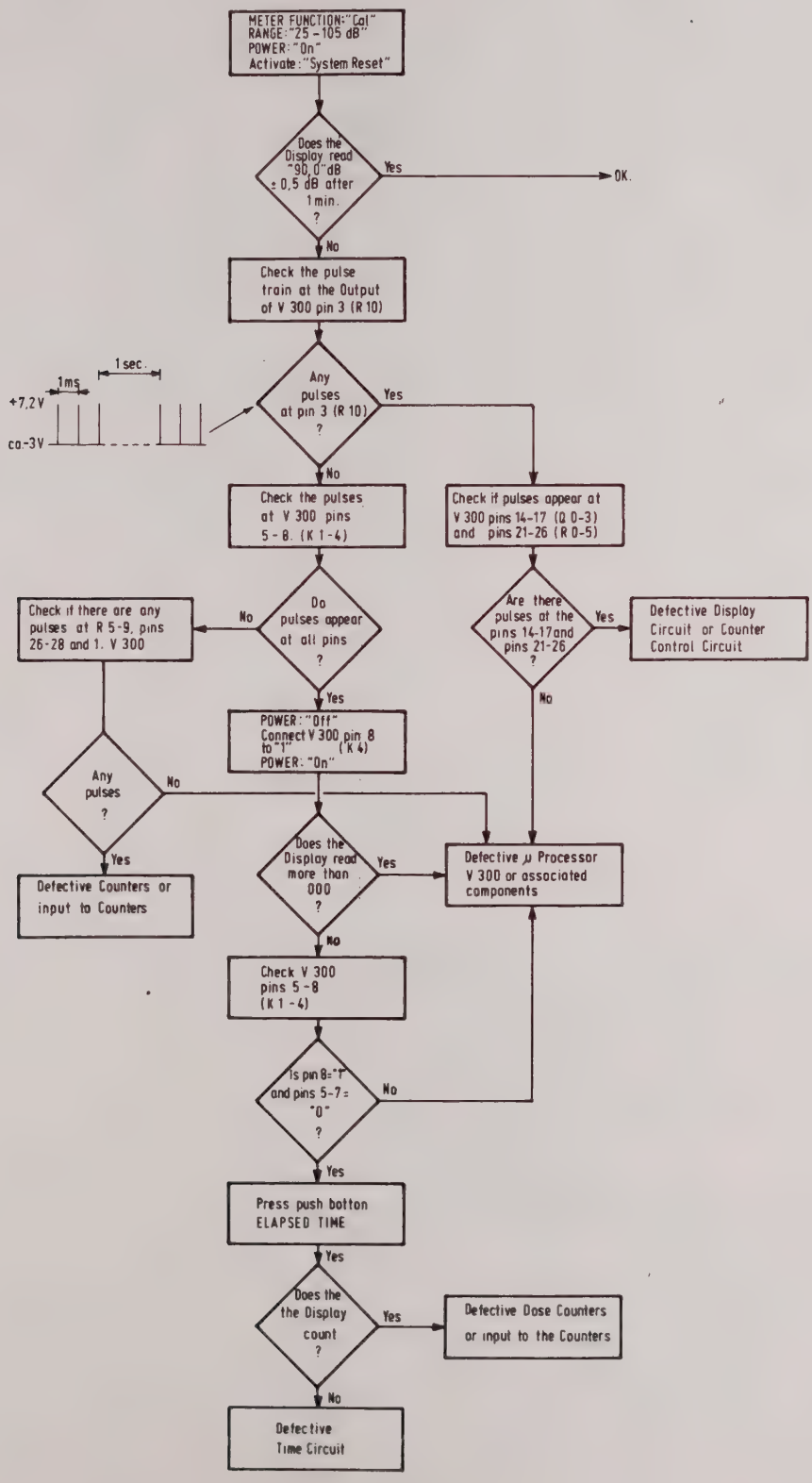
µProcessor Clock Gen. adjustment

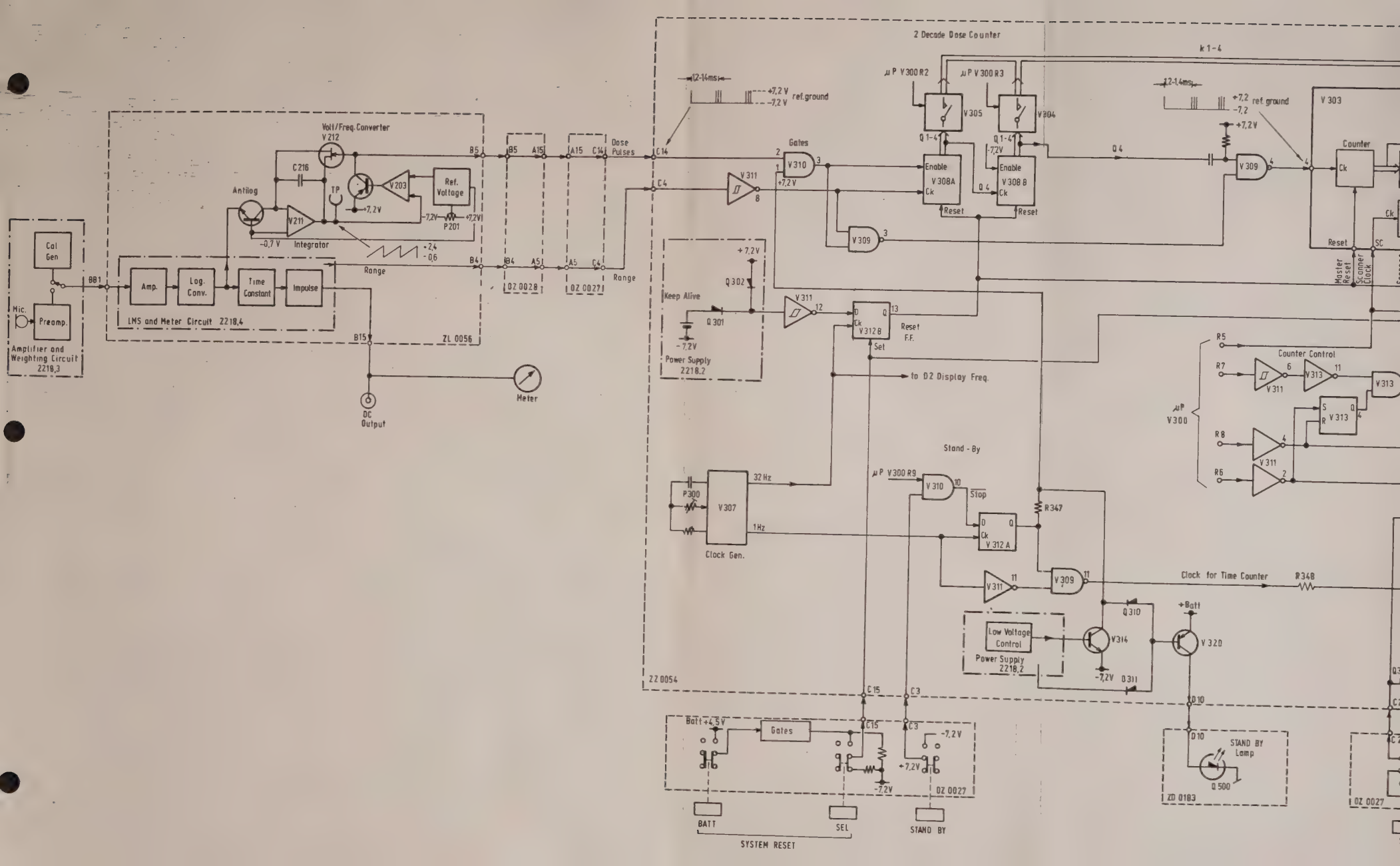
Check the frequency at the top of R300: 230 kHz ± 1 kHz.
If necessary adjust P304.

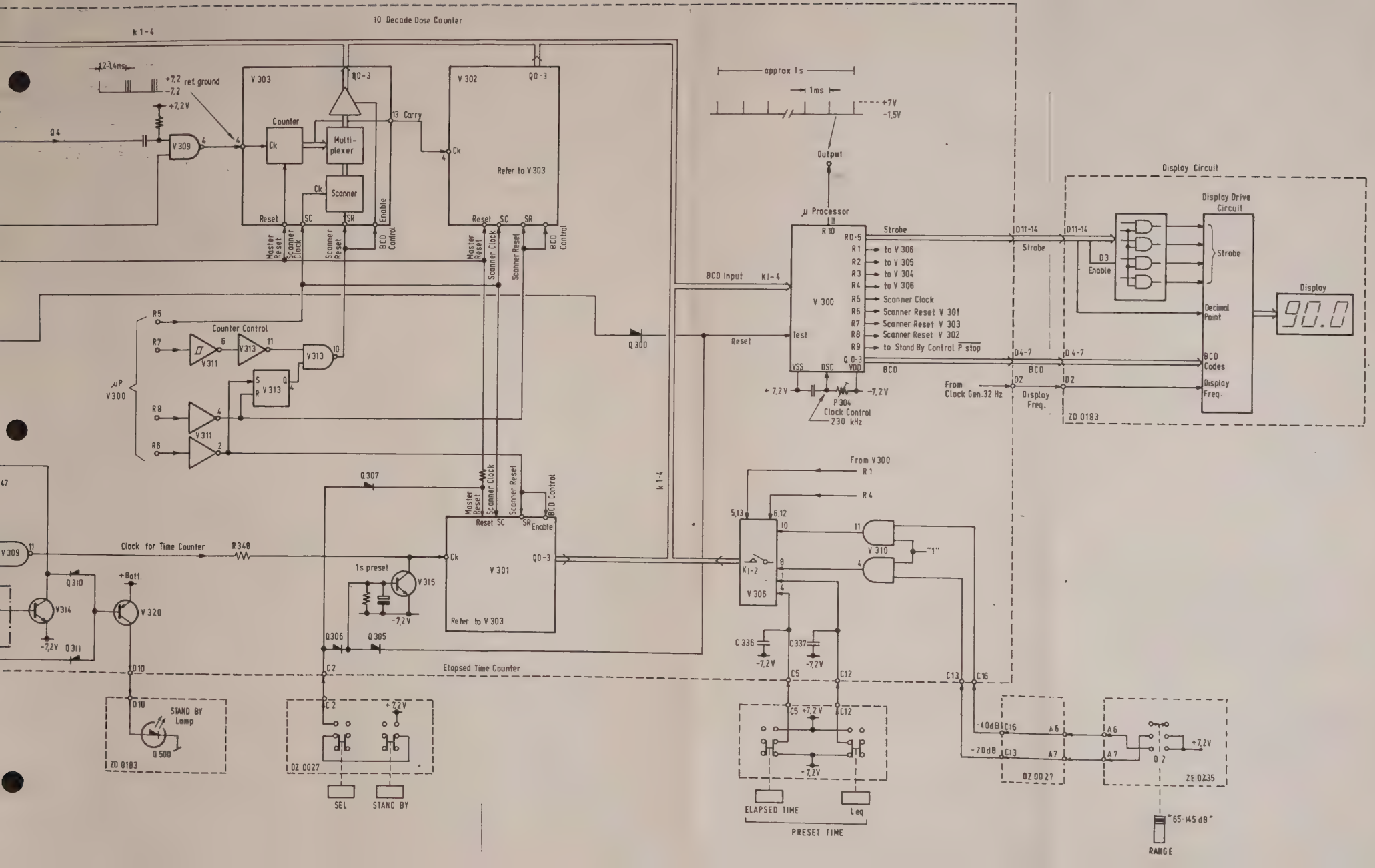
Trouble Shooting in the Calculation Circuit

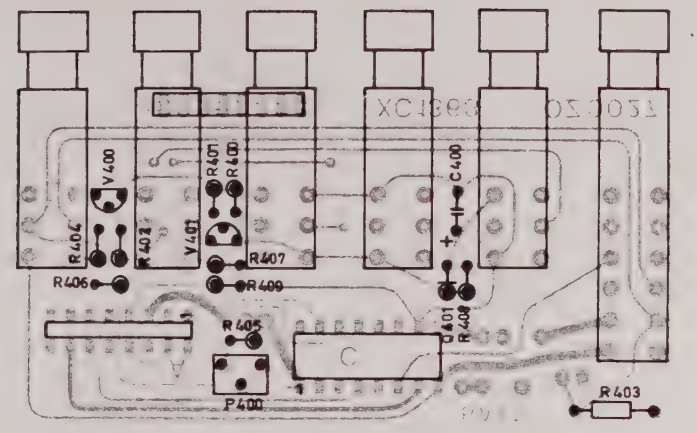
Notice! This Trouble Shooting should be regarded only as a guide for fault finding

Its like for instance hazard or periodic problems can not be found by this method

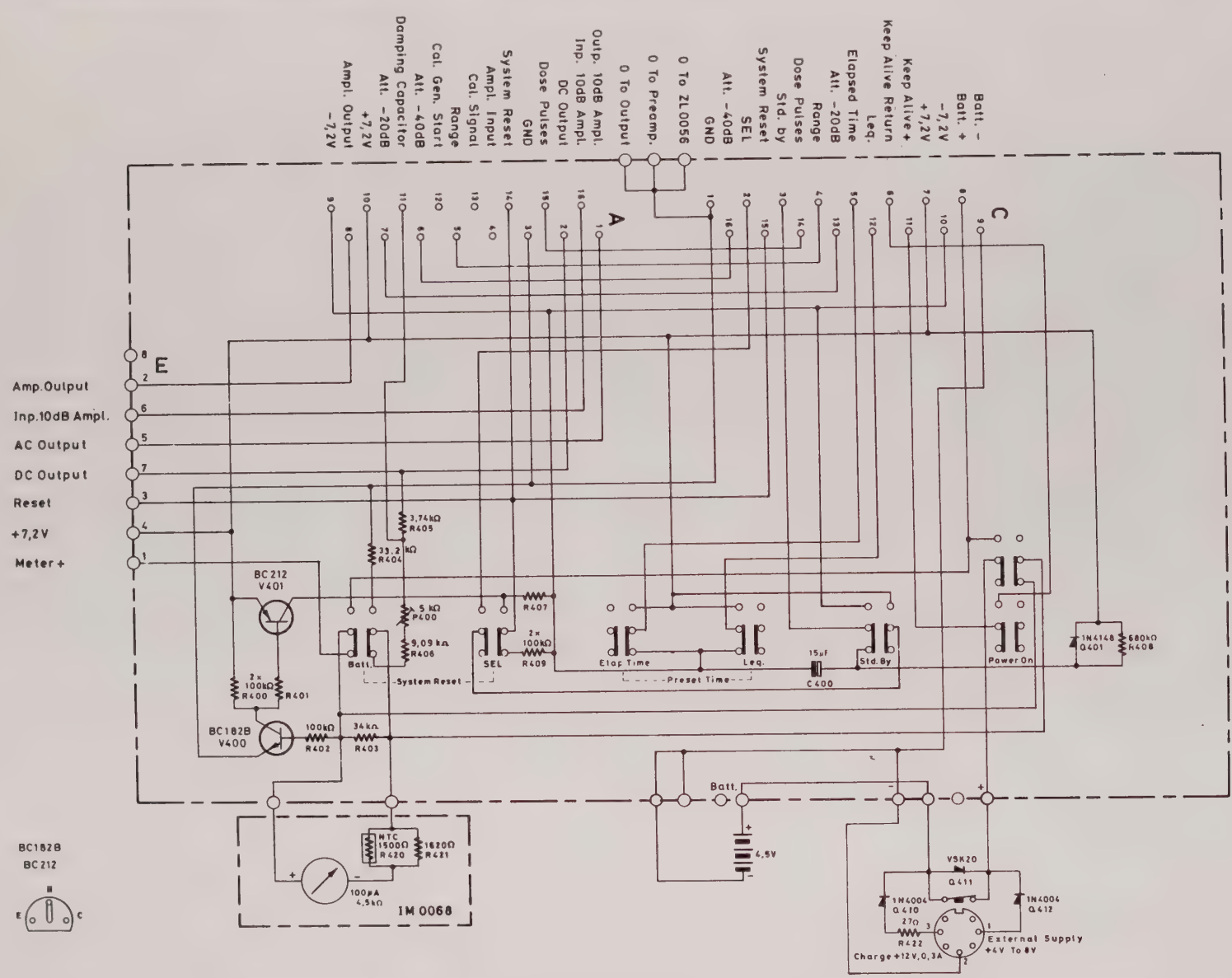

METER FUNCTION: "Cal"
RANGE: "25 - 105 dB"
POWER: "On"
Activate: "System Reset"
Does the Display read "90,0" dB ± 0,5 dB after 1 min. ?
Yes
OK.
No
Check the pulse train at the Output of V 300 pin 3 (R 10)
1 sec.
1 ms
+7,2 V
ca -3 V
Any pulses at pin 3 (R 10) ?
Yes
No
Check the pulses at V 300 pins 5 - 8. (K 1 - 4)
Check if pulses appear at V 300 pins 14-17 (Q 0-3) and pins 21-26 (R 0-5)
Do pulses appear at all pins ?
No
Check if there are any pulses at R 5-9, pins 26-28 and 1. V 300
Are there pulses at the pins 14-17 and pins 21-26 ?
Yes
Defective Display Circuit or Counter Control Circuit
No
Yes
POWER: "Off"
Connect V 300 pin 8 to "1" (K 4)
POWER: "On"
Any pulses ?
No
Yes
Defective Counters or input to Counters
Does the Display read more than 000 ?
Yes
Defective µ Processor V 300 or associated components
No
Check V 300 pins 5 - 8 (K 1 - 4)
Is pin 8 = "1" and pins 5-7 = "0" ?
No
Yes
Press push botton ELAPSED TIME
Yes
Does the the Display count ?
Yes
Defective Dose Counters or input to the Counters
No
Defective Time Circuit

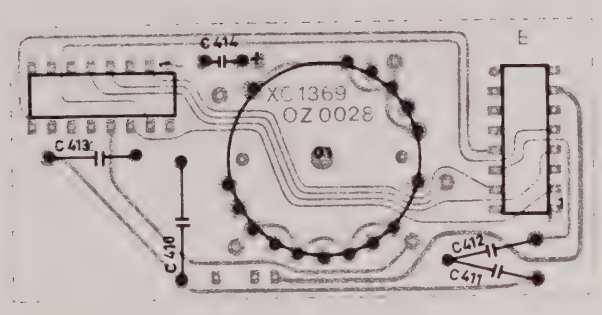

2 Decade Dose Counter
k 1-4
Cal Gen
Mic.
Preamp.
Amplifier and Weighting Circuit 2218,3
BB1
Amp.
Log. Conv.
Time Constant
Impulse
LMS and Meter Circuit 2218,4
ZL 0056
Volt/Freq.Converter V 212
C 216
Antilog
V 211
Integrator
TP
V 203
Ref. Voltage
+7,2 V
-7,2 V
P 201
-0,7 V
+2,4
-0,6
Range
B5
B4
B1
B15
A15
A5
C14
C4
Dose Pulses
OZ 0028
OZ 0027
DC Output
Meter
12-14ms
+7,2 V
-7,2 V
ref.ground
µP V 300 R2
µP V 300 R3
V 305
V 304
Q 1-4
Enable
V 308 A
V 308 B
Ck
Reset
Gates
V 310
V 311
V 309
Q 4
V 303
Counter
Master Reset
Scanner Clock
SC
Keep Alive
Q 302
Q 301
Power Supply 2218,2
V 312 B
Reset F.F.
Set
to D2 Display Freq.
R5
R7
R8
R6
Counter Control
V 313
µP V 300
Stand - By
µP V 300 R9
Stop
R 347
P 300
V 307
32 Hz
1 Hz
Clock Gen.
V 312 A
Clock for Time Counter
R 348
Low Voltage Control
Power Supply 2218,2
Q 310
Q 311
V 314
+Batt
V 320
ZZ 0054
C15
C3
Batt +4,5 V
Gates
-7,2 V
+7,2 V
OZ 0027
BATT
SEL
STAND BY
SYSTEM RESET
Q 10
STAND BY Lamp
Q 500
ZD 0183


10 Decade Dose Counter
k 1-4
12-14ms
+7,2 ref. ground
-7,2
+7,2V
Q 4
V 309
V 303
Q0-3
Counter
Ck
Multi-plexer
13 Carry
Scanner
Reset
SC
SR
Enable
BCD Control
Master Reset
Scanner Clock
Scanner Reset
V 302
Refer to V 303
approx 1 s
1ms
+7V
-1,5V
Output
µ Processor
R 10
Strobe
BCD Input
K1-4
V 300
Test
Reset
OSC
VDD
VSS
R0-5
R1 → to V 306
R2 → to V 305
R3 → to V 304
R4 → to V 306
R5 → Scanner Clock
R6 → Scanner Reset V 301
R7 → Scanner Reset V 303
R8 → Scanner Reset V 302
R9 → to Stand By Control P stop
Q 0-3
BCD
+ 7,2 V
-7,2 V
P 304
Clock Control
230 kHz
From Clock Gen. 32 Hz
Display Freq.
D11-14
D4-7
D2
Display Circuit
Display Drive Circuit
D3
Enable
Decimal Point
BCD Codes
Display
90.0
ZD 0183
Counter Control
R5
R7
R8
R6
V 311
V 313
µP V 300
Q 300
Q 307
Clock for Time Counter
R 348
1s preset
V 315
V 301
Refer to V 303
Q 306
Q 305
Q 310
V 314
V 320
D 311
+Batt.
-7,2V
D10
C2
Etopsed Time Counter
From V 300
R1
R4
5,13
6,12
K1-2
V 306
V 310
"1"
C 336
C 337
C5
C12
C13
C16
STAND BY Lamp
Q 500
ZD 0183
SEL
STAND BY
OZ 0027
ELAPSED TIME
Leq
PRESET TIME
-40dB
-20dB
A6
A7
ZE 0235
"65-145 dB"
RANGE

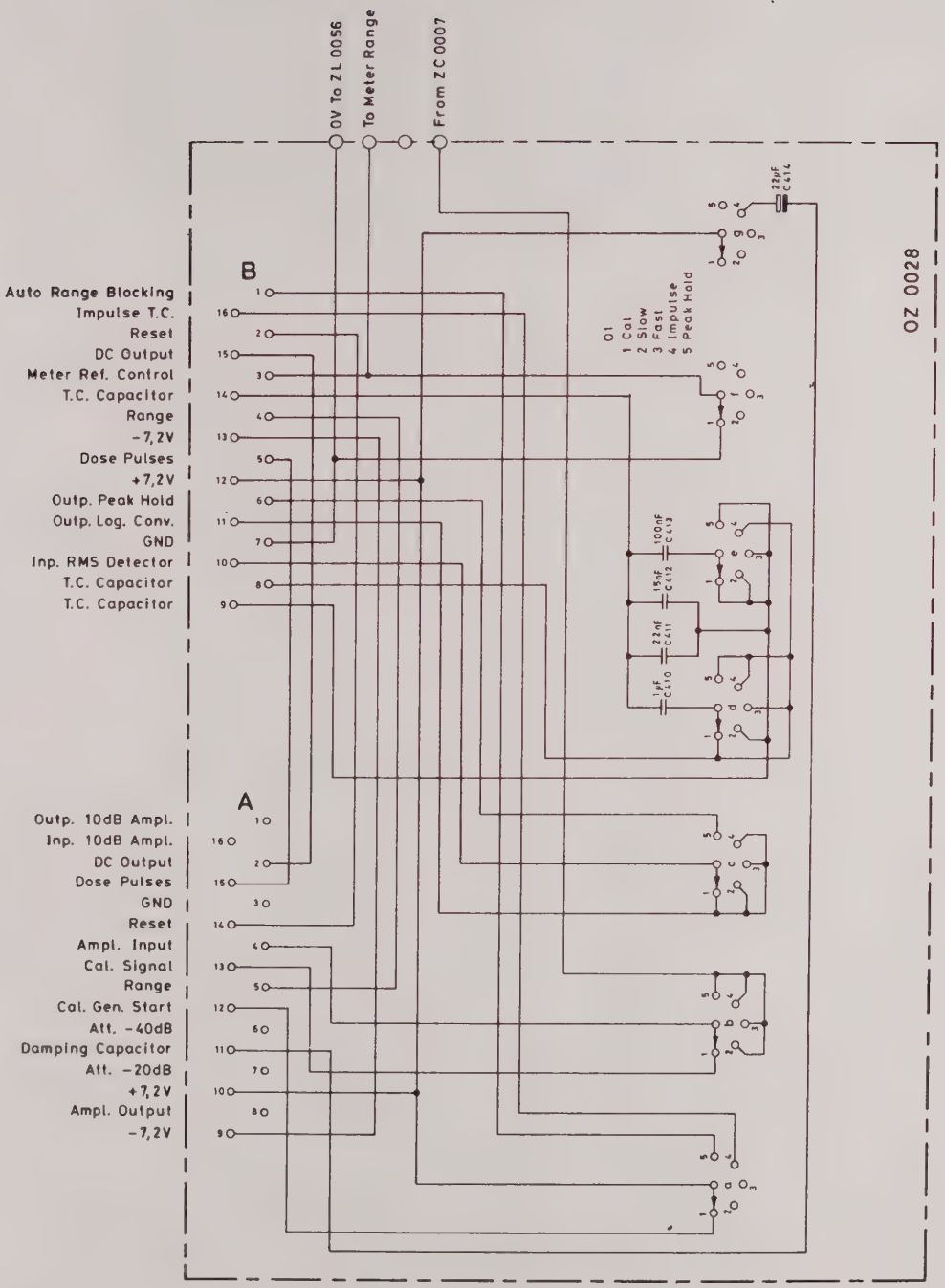


CIRCUIT DIAGRAM REF.	COMPONENT TYPE				STOCK REF.
C 400	Tantalum			15 µF/ 16 V	CF 0028
P 400	Cermet		1/2 W	5 kΩ	PG 2520
Q 401	Si.	1N4148		75 V/75 mA	QV 0216
R 400-402	Carbon	1/4 W	5%	100 kΩ	RB 5100
R 403	Metal	-	1%	34 kΩ	RF 4340
R 404	-	-	-	33,2 kΩ	RF 4332
R 405	-	-	-	3,74 kΩ	RF 3374
R 406	-	-	-	9,09 kΩ	RF 3909
R 407	Carbon	-	5%	100 kΩ	RB 5100
R 408	-	-	-	680 kΩ	RB 5680
R 409	-	-	-	100 kΩ	RB 5100
V 400	Si.		NPN	BC182B	VB 0055
V 401	Si.		PNP	BC212B	VB 0049
	16 pin Socket				JJ 1623
	8 pin Plug				JP 0805
	Selector Section				OJ 0070
	Printed Circuit Board				XC 1368


Batt. -
Batt. +
-7,2V
+7,2V
Keep Alive+
Keep Alive Return
Elapsed Time
Leq.
Att. -20dB
Range
Dose Pulses
Std. by
System Reset
SEL
Att. -40dB
GND
0 To ZL0056
0 To Preamp.
0 To Output
Outp. 10dB Ampl.
Inp. 10dB Ampl.
DC Output
Dose Pulses
GND
System Reset
Ampl. Input
Cal. Signal
Range
Cal. Gen. Start
Att. -40dB
Damping Capacitor
Att. -20dB
+7,2V
Ampl. Output
-7,2V
A
C
E
Amp.Output
Inp.10dB Ampl.
AC Output
DC Output
Reset
+7,2V
Meter+
3,74kΩ R405
33,2 kΩ R404
BC 212 V401
5 kΩ P400
9,09 kΩ R406
R407
2 x 100kΩ R409
Batt.
SEL
Etap Time
Leq.
Std.By
Power On
15µF C400
1N4148 Q401
680kΩ R408
System Reset
Preset Time
2 x 100kΩ R400
R401
BC182B V400
100kΩ R402
34kΩ R403
Batt.
4,5V
NTC 1500Ω R420
1820Ω R421
100µA 4,5kΩ
IM 0068
VSK20 Q411
1N4004 Q410
1N4004 Q412
270 R422
Charge+12V,0,3A
External Supply +4V To 8V
BC182B
BC212
E
C



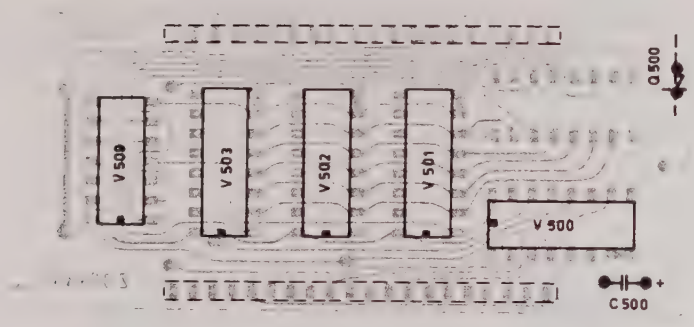
CIRCUIT DIAGRAM REF	COMPONENT TYPE		STOCK REF.
C 410	Polycarbonate	1 µF/100 V	CS 0384
C 411	-	22 nF/250 V	CS 0132
C 412	-	15 nF/400 V	CS 0131
C 413	-	100 nF/100 V	CS 0381
C 414	Tantalum	22 µF/ 16 V	CF 0042
O 1	Meter Function Switch		OH 3082
	Printed Circuit Board		XC 1369


0V To ZL 0056
To Meter Range
From ZC 0007
OZ 0028
B
Auto Range Blocking
Impulse T.C.
Reset
DC Output
Meter Ref. Control
T.C. Capacitor
Range
−7,2V
Dose Pulses
+7,2V
Outp. Peak Hold
Outp. Log. Conv.
GND
Inp. RMS Detector
T.C. Capacitor
T.C. Capacitor
A
Outp. 10dB Ampl.
Inp. 10dB Ampl.
DC Output
Dose Pulses
GND
Reset
Ampl. Input
Cal. Signal
Range
Cal. Gen. Start
Att. −40dB
Damping Capacitor
Att. −20dB
+7,2V
Ampl. Output
−7,2V
01
1 Cal
2 Slow
3 Fast
4 Impulse
5 Peak Hold
22µF C414
100nF C413
15nF C412
22nF C411
1µF C410

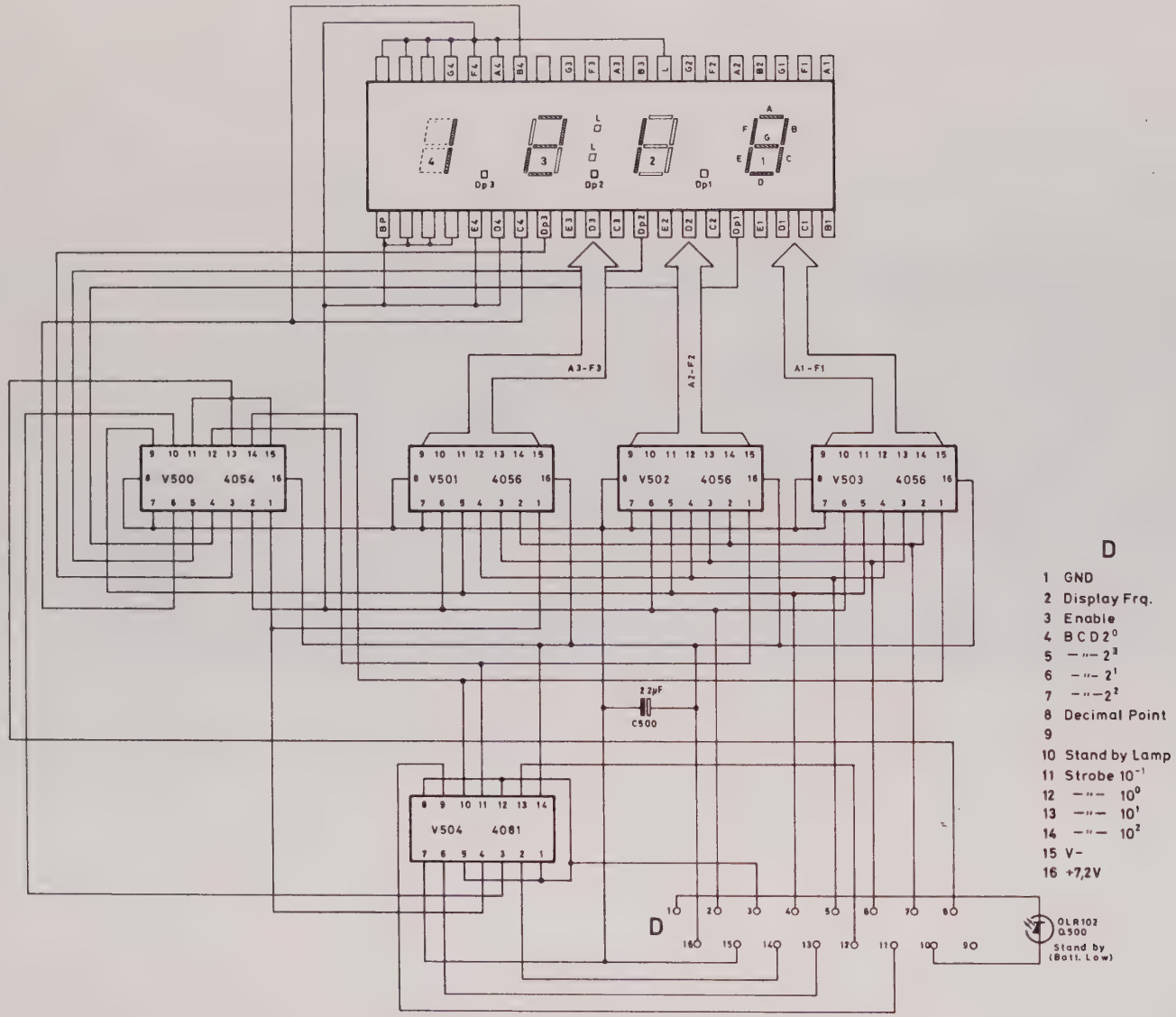
Circuit and Layout Diagrams with Parts List

ZD 0183

Display Board

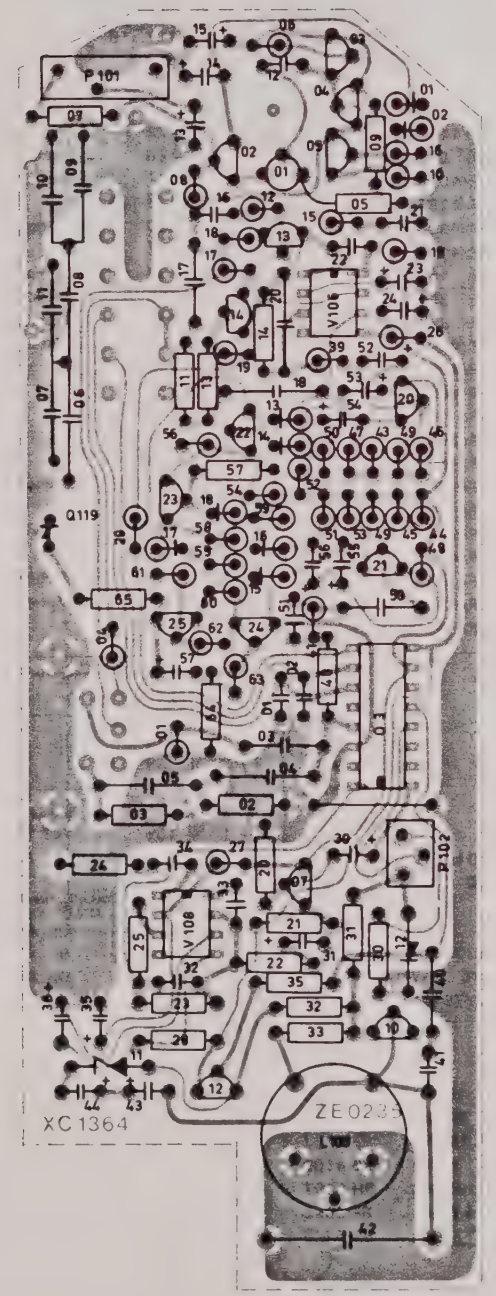


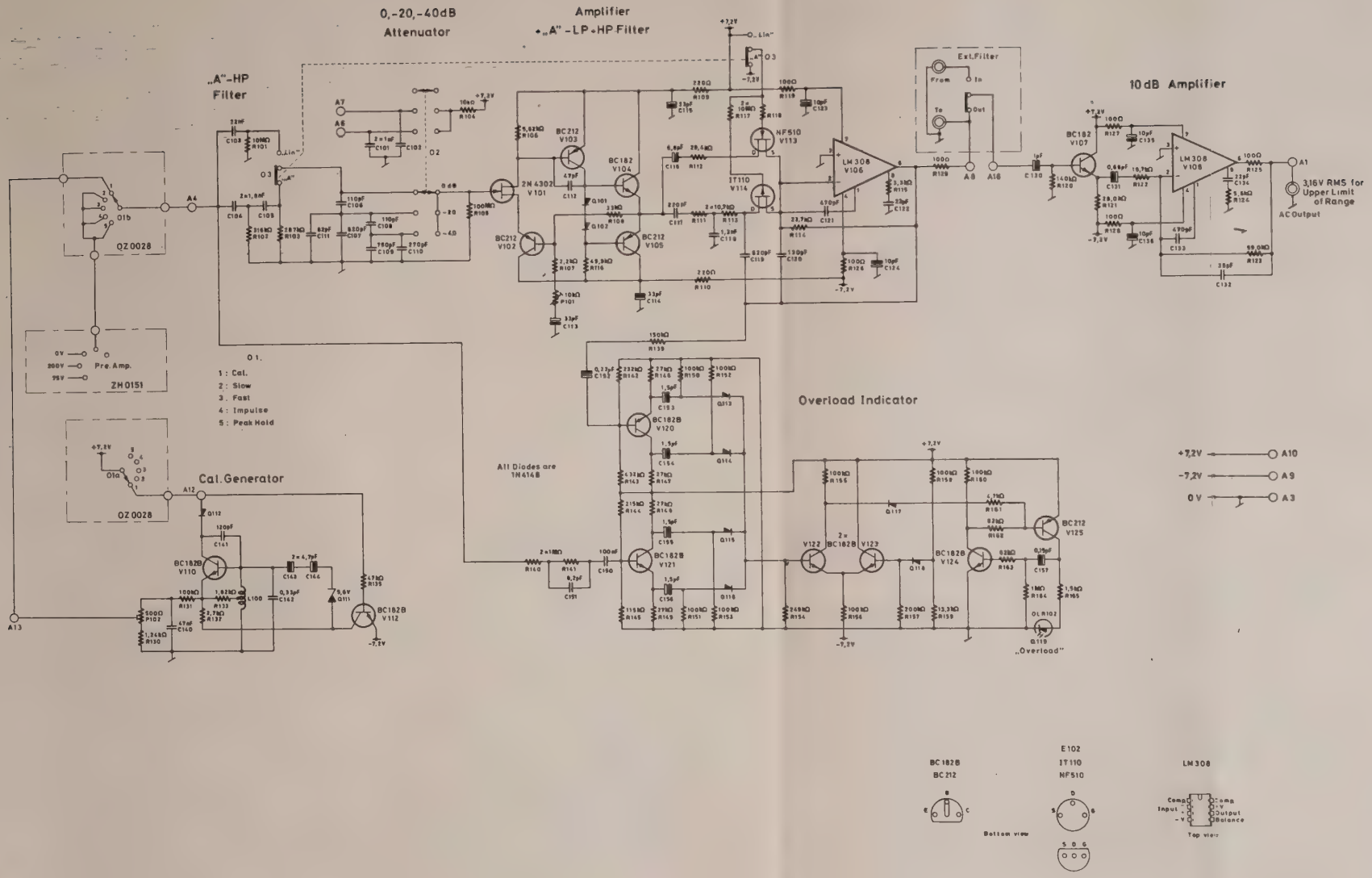
CIRCUIT DIAGRAM REF.	COMPONENT TYPE		STOCK REF.
C 500	Tantalum	22 µF/ 16 V	CF 0031
Q 500	LED	OLR-102	QV 4003
V 500	LCD-driver	CD4054AE	VD 2066
V 501-503	LCD-driver	CD4056QE	VD 2026
V 504	4 × 2 Input AND	CD4081BE	VD 2065
	14-pin Socket		JJ 1408
	16-pin Socket		JJ 1622
	20-pin Socket		JJ 2012
	LCD Display		VU 1001
	Printed Circuit Board		XC 1370



D

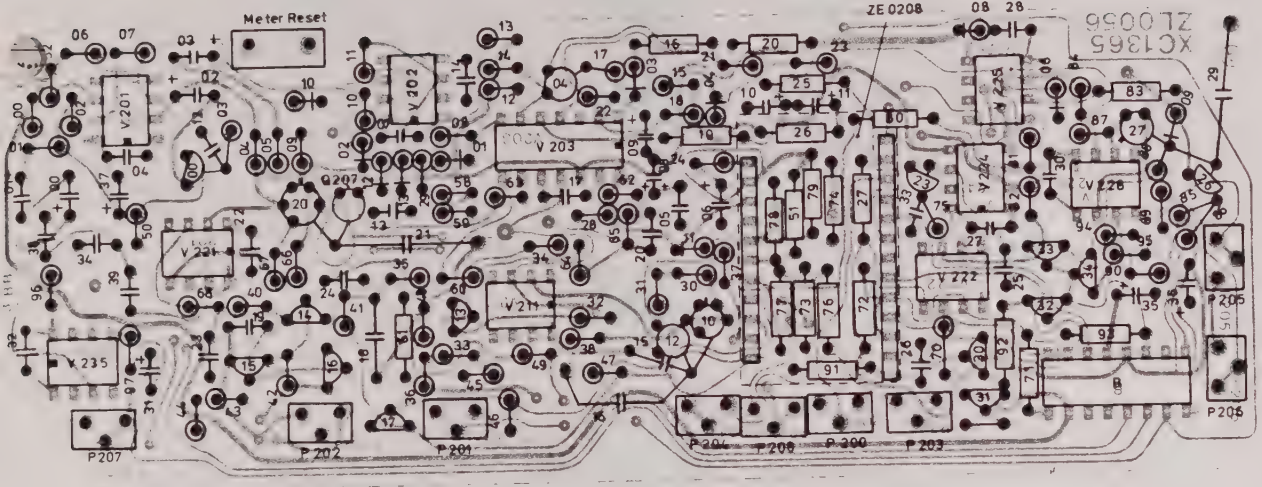
1 GND
2 Display Frq.
3 Enable
4 BCD 2^0
5 –"– 2^3
6 –"– 2^1
7 –"– 2^2
8 Decimal Point
9
10 Stand by Lamp
11 Strobe 10^{-1}
12 –"– 10^0
13 –"– 10^1
14 –"– 10^2
15 V-
16 +7,2V

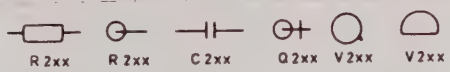

P101
P102
V108
Q119
XC1364
ZE0235
R1xx
C1xx
Q1xx
V1xx


0,-20,-40dB
Attenuator
Amplifier
+„A" -LP +HP Filter
„A"-HP
Filter
Ext.Filter
From
To
In
Out
10 dB Amplifier
Pre Amp.
ZH0151
OZ0028
01.
1 : Cal.
2 : Slow
3 : Fast
4 : Impulse
5 : Peak Hold
Cal.Generator
All Diodes are
1N4148
Overload Indicator
„Overload"
3,16V RMS for
Upper Limit
of Range
AC Output
+7,2V
-7,2V
0V
A10
A9
A3
BC182B
BC212
E102
1T110
NF510
LM308
Bottom view
Top view
Comp
Input
Output
Balance

CIRCUIT DIAGRAM REF.	COMPONENT TYPE				STOCK REF.
C 101,102	Ceramic			1 nF/400 V	CK 3101
C 103	Polyester			22 nF/250 V	CS 0400
C 104,105	Polystyrene			1,8 nF/ 63 V	CT 1153
C 106	-			110 pF/125 V	CT 1136
C 107	-			820 pF/ 63 V	CT 1121
C 108	-			110 pF/125 V	CT 1136
C 109	-			750 pF/125 V	CT 1146
C 110	-			270 pF/125 V	CT 1143
C 111	-			82 pF/160 V	CT 1162
C 112	Ceramic			47 pF/400 V	CK 1471
C 113-115	Tantalum			33 µF/ 10 V	CF 0034
C 116	-			6,8 µF/ 35 V	CF 0009
C 117	Polycarbonate			220 nF/110 V	CS 0389
C 118	Polystyrene			1,3 nF/ 63 V	CT 1150
C 119	-			620 pF/100 V	CT 1109
C 120	-			130 pF/125 V	CT 1138
C 121	Ceramic			470 pF/400 V	CK 2470
C 122	-			22 pF/400 V	CK 1220
C 123,124	Tantalum			10 µF/ 16 V	CF 0059
C 130	-			1 µF/ 35 V	CF 0062
C 131	-			0,68 µF/ 35 V	CF 0044
C 132	Ceramic			39 pF/400 V	CK 1391
C 133	-			470 pF/400 V	CK 2470
C 134	-			22 pF/400 V	CK 1220
C 135,136	Tantalum			10 µF/ 16 V	CF 0059
C 140	Polyester			47 nF/250 V	CS 0401
C 141	Ceramic			120 pF/400 V	CK 2122
C 142	Polycarbonate			0,33 µF/100 V	CS 0340
C 143,144	Tantalum			4,7 µF/ 10 V	CF 0018
C 150	Polyester			100 nF/250 V	CS 0402
C 151	Ceramic			8,2 pF/400 V	CK 0820
C 152	Tantalum			0,22 µF/ 35 V	CF 0063
C 153-156	-			1,5 µF/ 35 V	CF 0008
C 157	-			0,15 µF/ 35 V	CF 0050
L 100	Oscillator coil				LB 0660
O 2	"Range"				NN 0075
O 3	"Weighting Network"				NN 0088
P 101	Cermet		3/4 W	10 kΩ	PG 3123
P 102	-		1/2 W	500 Ω	PG 1509
Q 101,102	Si.	1N4148		75 V/75 mA	QV 0216
Q 111	Ze.	ZPD5,6		5,3-5,9 V/0,25 W	QV 1105
Q 112-118	Si.	1N4148		75 V/75 mA	QV 0216
Q 119	LED	OLR-102			QV 4003
R 101	Carbon	1/4 W	5%	10 MΩ	RB 7100
R 102	Metal	-	1%	316 kΩ	RF 5316
R 103	-	-	-	287 kΩ	RF 5287
R 104	Carbon	-	5%	10 kΩ	RB 4100
R 105	-	-	10%	100 MΩ	RH 0907
R 106	Metal	-	1%	5,62 kΩ	RF 3562
R 107	Carbon	-	5%	2,2 kΩ	RB 3220

CIRCUIT DIAGRAM REF.	COMPONENT TYPE				STOCK REF.
R 108	Carbon	1/4 W	5%	33 kΩ	RB 4330
R 109,110	-	-	-	220 Ω	RB 2220
R 111	Metal	-	1%	10,7 kΩ	RF 4107
R 112	-	-	-	29,4 kΩ	RF 4294
R 113	-	-	-	10,7 kΩ	RF 4107
R 114	-	-	-	23,7 kΩ	RF 4237
R 115	Carbon	-	5%	3,3 kΩ	RB 3330
R 116	Metal	-	1%	49,9 kΩ	RF 4499
R 117,118	Carbon	-	5%	10 MΩ	RB 7100
R 119	-	-	-	100 Ω	RB 2100
R 120	Metal	-	1%	140 kΩ	RF 5140
R 121	-	-	-	28 kΩ	RF 4280
R 122	-	-	-	18,7 kΩ	RF 4187
R 123	-	-	-	59,0 kΩ	RF 4590
R 124	Carbon	-	5%	5,6 kΩ	RB 3560
R 125-129	-	-	-	100 Ω	RB 2100
R 130	Metal	-	1%	1,24 kΩ	RF 3124
R 131	-	-	-	100 kΩ	RF 5100
R 132	Carbon	-	5%	2,7 kΩ	RB 3270
R 133	Metal	-	1%	1,82 kΩ	RF 3182
R 135	Carbon	-	5%	47 kΩ	RB 4470
R 139	Metal	-	1%	150 kΩ	RF 5150
R 140,141	-	-	-	1 MΩ	RF 6100
R 142	-	-	-	232 kΩ	RF 5232
R 143	-	-	-	432 kΩ	RF 5432
R 144	-	-	-	215 kΩ	RF 5215
R 145	-	-	-	115 kΩ	RF 5115
R 146-149	Carbon	-	5%	27 kΩ	RB 4270
R 150-153	-	-	-	100 kΩ	RB 5100
R 154	Metal	-	1%	249 kΩ	RF 5249
R 155	-	-	-	100 kΩ	RF 5100
R 156	Carbon	-	5%	100 kΩ	RB 5100
R 157	Metal	-	1%	200 kΩ	RF 5200
R 158	-	-	-	100 kΩ	RF 5100
R 159	-	-	-	13,3 kΩ	RF 4133
R 160	Carbon	-	5%	180 kΩ	RB 5180
R 161	-	-	-	4,7 kΩ	RB 3470
R 162,163	-	-	-	82 kΩ	RB 4820
R 164	-	-	-	1 MΩ	RB 6100
R 165	-	-	-	1,5 kΩ	RB 3150
V 101	FET		N	E102	VB 2045
V 102,103	Si.		PNP	BC212B	VB 0049
V 104	-		NPN	BC182B	VB 0055
V 105	Si.		PNP	BC212B	VB 0049
V 106	Op. Amp.			LM308N	VE 0046
V 107	Si.		NPN	BC182B	VB 0055
V 108	Op. Amp.			LM308N	VE 0046
V 110	Si.		NPN	BC182B	VB 0055
V 112	Si.		NPN	BC182B	VB 0055
V 113	FET		N	NF510	VB 1059
V 114	FET		P	IT110	VB 1505
V 120-124	Si.		NPN	BC182B	VB 0055
V 125	Si.		PNP	BC212B	VB 0049
	8-pin Socket				JJ 0804
	16-pin Socket				JJ 1622
	Printed Circuit Board				XC 1364

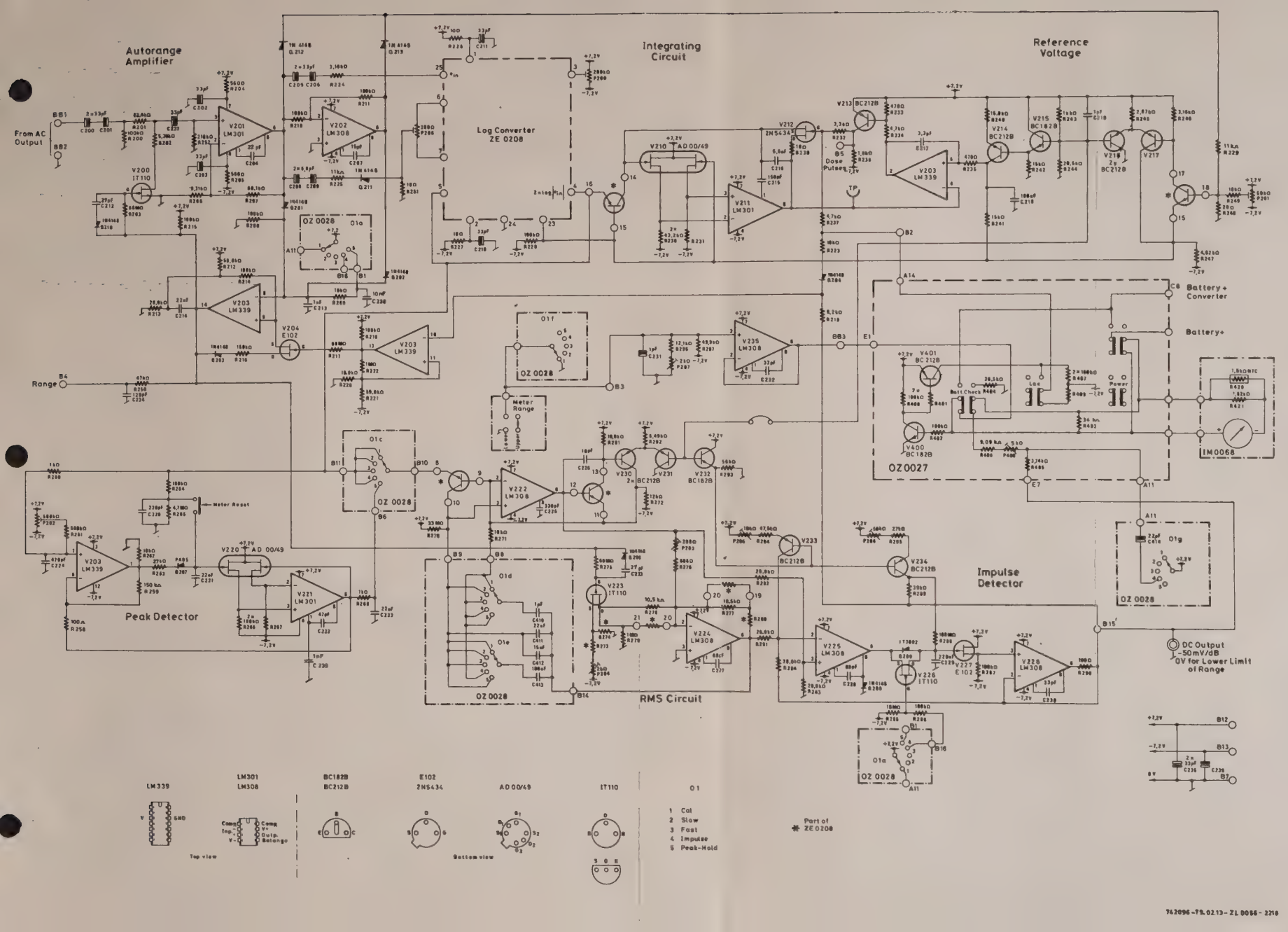




CIRCUIT DIAGRAM REF.	COMPONENT TYPE			STOCK REF.
C 200-203	Tantalum		33 µF/ 10 V	CF 0034
C 204	Ceramic		22 pF/400 V	CK 1220
C 205,206	Tantalum		33 µF/ 10 V	CF 0034
C 207	Ceramic		15 pF/400 V	CK 1150
C 208,209	Tantalum		6,8 µF/ 16 V	CF 0035
C 210,211	-		33 µF/ 10 V	CF 0034
C 212	Ceramic		27 pF/400 V	CK 1271
C 213	-		1 nF/400 V	CK 3101
C 214	-		22 nF/ 30 V	CK 4222
C 215	Polystyrene		150 pF/400 V	CT 1139
C 216	-		5,6 nF/100 V	CT 1574
C 217	Ceramic		3,3 pF/400 V	CK 0330
C 218	Polyester		100 nF/250 V	CS 0402
C 219	Ceramic		1 nF/400 V	CK 3101
C 220	-		220 pF/400 V	CK 2222
C 221	Polycarbonate		22 nF/250 V	CS 0105
C 222	Ceramic		47 pF/400 V	CK 1471
C 223	-		22 nF/ 30 V	CK 4222
C 224	-		470 pF/400 V	CK 2470
C 225	-		330 pF/400 V	CK 2334
C 226	-		10 pF/400 V	CK 1100
C 227,228	-		68 pF/400 V	CK 1683
C 229	Polycarbonate		220 nF/100 V	CS 0339
C 230	Ceramic		33 pF/400 V	CK 1330
C 231	Tantalum		1 µF/ 35 V	CF 0062
C 232	Ceramic		33 pF/400 V	CK 1330
C 233	-		27 pF/400 V	CK 1271
C 234	-		120 pF/400 V	CK 2122
C 235-237	Tantalum		33 µF/ 10 V	CF 0034
C 238	Ceramic		10 nF/ 30 V	CK 4101
C 239	-		1 nF/ 63 V	CK 3102
P 200	Cermet	1/2 W	200 kΩ	PG 4207
P 201	-	-	50 kΩ	PG 3515
P 202	-	-	500 kΩ	PG 4511
P 203	-	-	200 Ω	PG 1207
P 204	-	-	2 kΩ	PG 2212
P 205	-	-	10 kΩ	PG 3121
P 206	-	-	50 kΩ	PG 3515
P 207	-	-	2 kΩ	PG 2212
P 208	-	3/4 W	200 Ω	PG 1206

CIRCUIT DIAGRAM REF.	COMPONENT TYPE			STOCK REF.
Q 201-204	Si.	1N4148	75 V/75 mA	QV 0216
Q 206	-	1N4148	75 V/75 mA	QV 0216
Q 207	-	PAD5 sel.	45 V/50 mA	QV 0250
Q 208	-	1N4148	75 V/75 mA	QV 0216
Q 209	-	IT3002	150 V/100 mA	QV 0242
Q 210-213	-	1N4148	75 V/75 mA	QV 0216

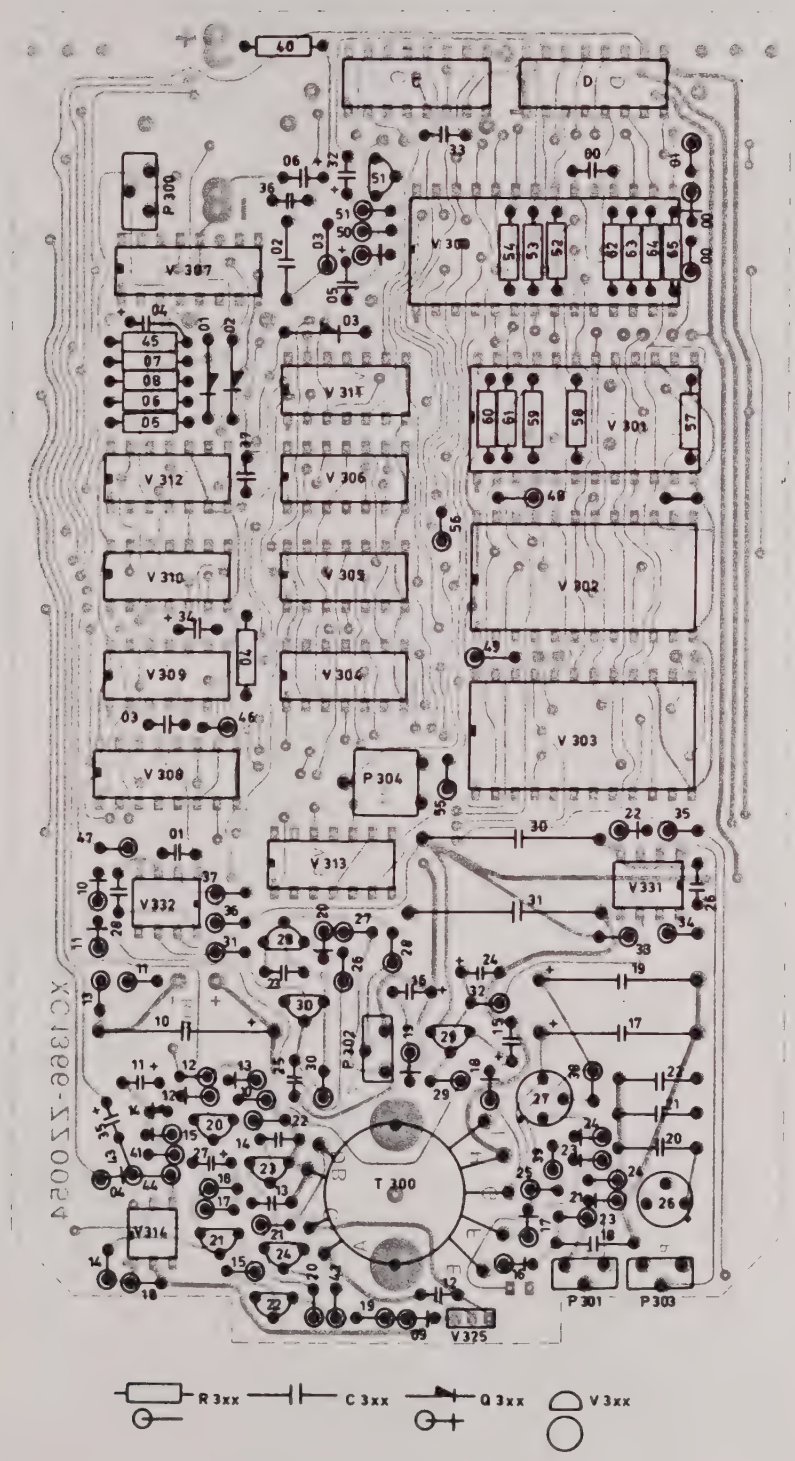
R 200	Carbon	1/4 W	5%	100 kΩ	RB 5100
R 201	Metal	-	1%	63,4 kΩ	RF 4634
R 202	-	-	-	5,36 kΩ	RF 3536
R 203	Carbon	-	5%	68 MΩ	RH 0919
R 204,205	-	-	-	560 Ω	RB 2560
R 206	Metal	-	1%	9,31 kΩ	RF 3931
R 207	-	-	-	68,1 kΩ	RF 4681
R 208	Carbon	-	5%	100 kΩ	RB 5100
R 209	-	-	-	10 kΩ	RB 4100
R 210,211	Metal	-	1%	100 kΩ	RF 5100
R 212	-	-	-	59 kΩ	RF 4590
R 213	-	-	-	28 kΩ	RF 4280
R 214,215	Carbon	-	5%	100 kΩ	RB 5100
R 216	-	-	-	150 kΩ	RB 5150
R 217	-	-	-	68 MΩ	RH 0919
R 218	-	-	-	100 kΩ	RB 5100
R 219	-	-	-	8,2 kΩ	RB 3820
R 220	Metal	-	1%	10 kΩ	RF 4100
R 221	-	-	-	59 kΩ	RF 4590
R 222	Carbon	-	5%	1 MΩ	RB 6100
R 223	-	-	-	10 kΩ	RB 4100
R 224	Metal	-	1%	3,16 kΩ	RF 3316
R 225	-	-	-	11 kΩ	RF 4110
R 226,227	Carbon	-	5%	10 Ω	RB 1100
R 228	Metal	-	1%	100 kΩ	RF 5100
R 229	-	-	-	11 kΩ	RF 4110
R 230,231	-	-	-	43,2 kΩ	RF 4432
R 232	Carbon	-	5%	3,3 kΩ	RB 3330
R 233	-	-	-	470 Ω	RB 2470
R 234	-	-	-	4,7 kΩ	RB 3470
R 235	-	-	-	470 Ω	RB 2470
R 236	-	-	-	1,8 kΩ	RB 3180
R 237	-	-	-	4,7 kΩ	RB 3470

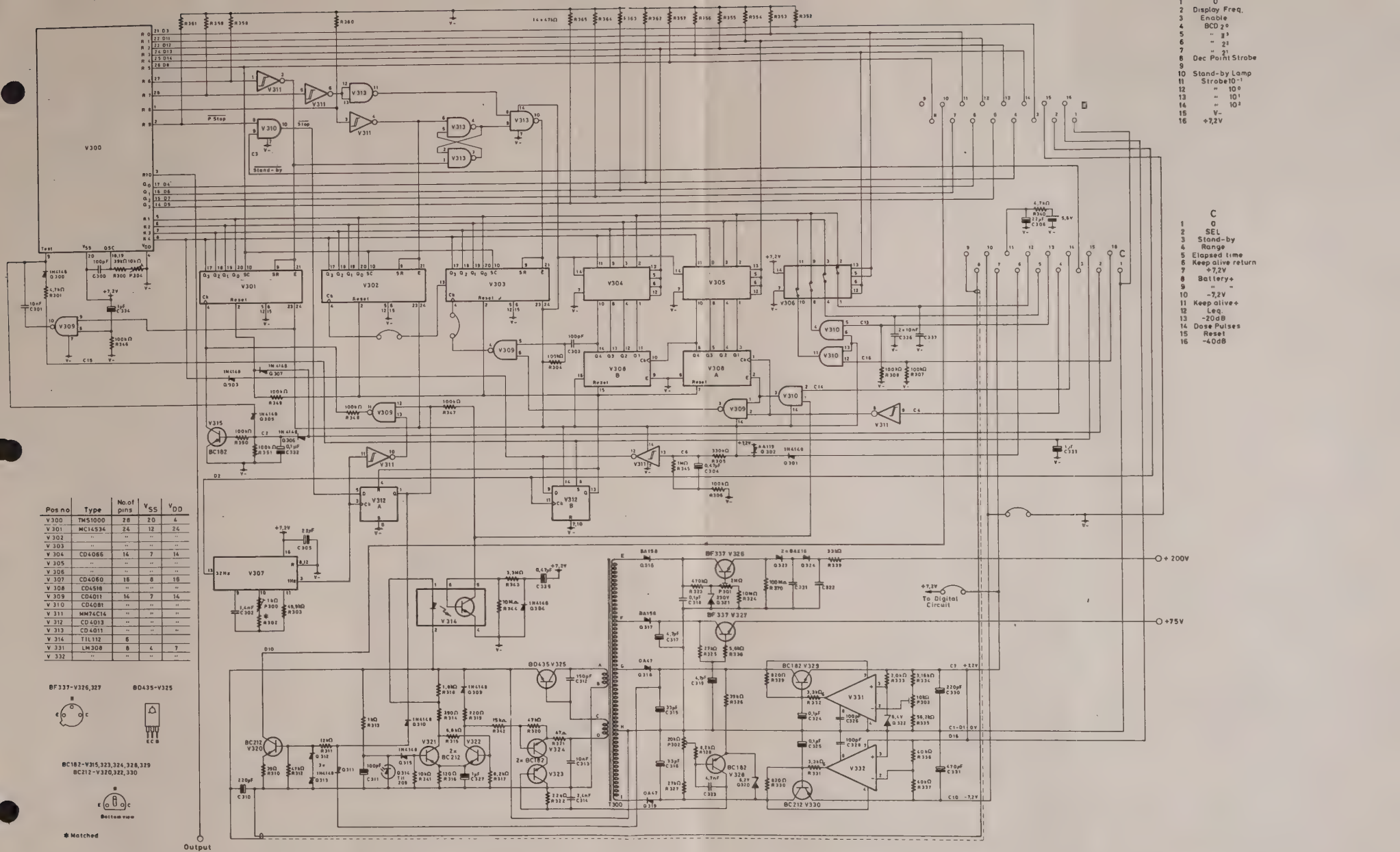

Autorange Amplifier
Integrating Circuit
Reference Voltage
Log Converter ZE 0208
From AC Output
Range
Peak Detector
RMS Circuit
Impulse Detector
Battery + Converter
Battery +
Meter Reset
DC Output -50mV/dB 0V for Lower Limit of Range
LM339
LM301 LM308
BC182B BC212B
E102 2N5434
AD 00/49
IT110
Top view
Bottom view
Part of ZE 0208
1 Cal
2 Slow
3 Fast
4 Impulse
5 Peak-Hold

CIRCUIT DIAGRAM REF.	COMPONENT TYPE				STOCK REF.
R 238	Carbon	1/4 W	5%	10 Ω	RB 1100
R 240,241	Metal	-	1%	15 kΩ	RF 4150
R 242	Carbon	-	5%	15 kΩ	RB 4150
R 243	Metal	-	1%	15 kΩ	RF 4150
R 244	-	-	-	20,5 kΩ	RF 4205
R 245	-	-	-	2,67 kΩ	RF 3267
R 246	-	-	-	3,16 kΩ	RF 3316
R 247	-	-	-	4,02 kΩ	RF 3402
R 248	-	-	-	20 Ω	RF 1200
R 249	-	-	-	10 kΩ	RF 4100
R 250	Carbon	-	5%	47 kΩ	RB 4470
R 251	-	-	-	10 Ω	RB 1100
R 252	Metal	-	1%	210 kΩ	RF 5210
R 258	-	-	-	100 Ω	RF 2100
R 259	-	-	-	150 kΩ	RF 5150
R 260	Carbon	-	5%	1 kΩ	RB 3100
R 261	-	-	-	560 kΩ	RB 5560
R 262	-	-	-	10 kΩ	RB 4100
R 263	-	-	-	27 kΩ	RB 4270
R 264	-	-	-	180 kΩ	RB 5180
R 265	-	-	-	4,7 MΩ	RB 6470
R 266,267	-	-	-	180 kΩ	RB 5180
R 268	-	-	-	1 kΩ	RB 3100
R 270	-	-	-	33 MΩ	RH 0016
R 271	-	-	-	10 kΩ	RB 4100
R 272	-	-	-	12 kΩ	RB 4120
R 273, 274	Selected to R280 and ZE 0208				
R 275	-	-	-	68 MΩ	RH 0919
R 276	Metal	-	1%	806 Ω	RF 2806
R 277,278	-	-	-	10,5 kΩ	RF 4105
R 279	Carbon	-	5%	1 MΩ	RB 6100
R 280	Selected to R273, 274 and ZE 0208				
R 281-284	Metal	-	1%	20 kΩ	RF 4200
R 285	Carbon	-	5%	10 MΩ	RB 7100
R 286,287	-	-	-	100 kΩ	RB 5100
R 288	-	-	-	100 MΩ	RH 0907
R 289	-	-	-	39 kΩ	RB 4390
R 290	-	-	-	100 Ω	RB 2100
R 291	Metal	-	1%	10 kΩ	RF 4100
R 292	-	-	-	6,49 kΩ	RF 3649
R 293	Carbon	-	5%	56 kΩ	RB 4560
R 294	Metal	-	1%	47,5 kΩ	RF 4475
R 295	Carbon	-	5%	27 kΩ	RB 4270
R 296	Metal	-	1%	12,1 kΩ	RF 4121
R 297	-	-	-	49,9 kΩ	RF 4499

CIRCUIT DIAGRAM REF.	COMPONENT TYPE			STOCK REF.
V 200	FET	P	IT110	VB 1505
V 201	Op. Amp.		LM301	VE 0017
V 202	Op. Amp.		LM308	VE 0046
V 203	4 × Comparator		LM339	VE 0110
V 204	FET	N	E102	VB 1027
V 210	2 × FET	N	AD00/49	VB 1048
V 211	Op. Amp.		LM301	VE 0017
V 212	FET		2N5434	VB 1074
V 213,214	Si.	PNP	BC212B	VB 0049
V 215	Si.	NPN	BS182B	VB 0055
V 216,217	Si.	PNP	BC212B	VB 0049
V 220	2 × FET sel.	N	AD00/49	VB 1078
V 221	Op. Amp.		LM301	VE 0017
V 222	Op. Amp.		LM308	VE 0046
V 223	FET	P	IT110	VB 1505
V 224,225	Op. Amp.		LM308	VE 0046
V 226	FET	P	IT110	VB 1505
V 227	FET sel.	N	E102	VB 1016
V 228	Op. Amp.		LM308	VE 0046
V 230,231	Si.	PNP	BC212B	VB 0049
V 232	Si.	NPN	BS182B	VB 0055
V 233,234	Si.	PNP	BC212B	VB 0049
V 235	Op. Amp.		LM308	VE 0046

8-pin Socket	JJ 0804
11-pin Socket	JJ 1105
13-pin Socket	JJ 1303
14-pin Socket	JJ 1408
16-pin Socket	JJ 1622
Meter Reset,push button	NT 0207
Thick Film Circuit	ZE 0208
Printed Circuit Board	XC 1365


XC1356-ZZ0054
V 307
V 313
V 312
V 306
V 310
V 305
V 309
V 304
V 308
P 304
V 313
V 332
V 331
P 302
T 300
V314
P 301
P 303
V 325
V 301
V 302
V 303
P 300
R 3xx
C 3xx
Q 3xx
V 3xx



Pos no	Type	No.of pins	V_{SS}	V_{DD}
V 300	TMS1000	28	20	4
V 301	MC14534	24	12	24
V 302	"	"	"	"
V 303	"	"	"	"
V 304	CD4066	14	7	14
V 305	"	"	"	"
V 306	"	"	"	"
V 307	CD4060	16	8	16
V 308	CD4518	"	"	"
V 309	CD4011	14	7	14
V 310	CD4081	"	"	"
V 311	MM74C14	"	"	"
V 312	CD4013	"	"	"
V 313	CD4011	"	"	"
V 314	TIL112	6		
V 331	LM308	8	4	7
V 332	"	"	"	"

BF337-V326,327 BD435-V325

BC182-V315,323,324,326,329
BC212-V320,322,330

Bottom view

* Matched

B29163-17 08 79-22 0054-2218

CIRCUIT DIAGRAM REF.	COMPONENT TYPE		STOCK REF.
C 300	Ceramic	100 pF/400 V	CK 2103
C 301	-	10 nF/ 30 V	CK 4101
C 302	Mica	1,4 nF/200 V	CM 0005
C 303	Ceramic	100 pF/400 V	CK 2103
C 304	Tantalum	0,47 µF/ 35 V	CF 0027
C 305,306	-	22 µF/ 16 V	CF 0031
C 310	Electrolytic	220 µF/ 10 V	CE 0306
C 311	Tantalum	100 µF/ 3 V	CF 0019
C 312	Ceramic	150 pF/400 V	CK 2151
C 313	-	10 nF/ 30 V	CK 4101
C 314	Polystyrene	2,4 nF/ 63 V	CT 1129
C 315,316	Tantalum	33 µF/ 10 V	CF 0034
C 317	Electrolytic	4,7 µF/100 V	CE 0624
C 318	Polyester	0,1 µF/250 V	CS 0402
C 319	Electrolytic	4,7 µF/100 V	CE 0624
C 321, 322	Polyester	0,1 µF/250 V	CS 0402
C 323	Ceramic	4,7 nF/ 30 V	CK 3473
C 324,325	Tantalum	0,1 µF/ 35 V	CF 0049
C 326	Ceramic	100 pF/400 V	CK 2103
C 327	Tantalum	1 µF/ 35 V	CF 0062
C 328	Ceramic	100 pF/400 V	CK 2103
C 330	Electrolytic	220 µF/ 10 V	CE 0306
C 331	-	470 µF/ 10 V	CE 0305
C 332	Tantalum	0,1 µF/ 35 V	CF 0049
C 333,334	-	1 µF/ 35 V	CF 0062
C 335	-	0,47 µF/ 35 V	CF 0027
C 336,337	Ceramic	10 nF/ 30 V	CK 4101

P 300	Cermet	1/2 W	1 kΩ	PG 2114
P 301	-	-	2 MΩ	PG 5203
P 302	-	3/4 W	20 kΩ	PG 3209
P 303	-	1/2 W	10 kΩ	PG 3121
P 304	-	-	10 kΩ	PG 3122

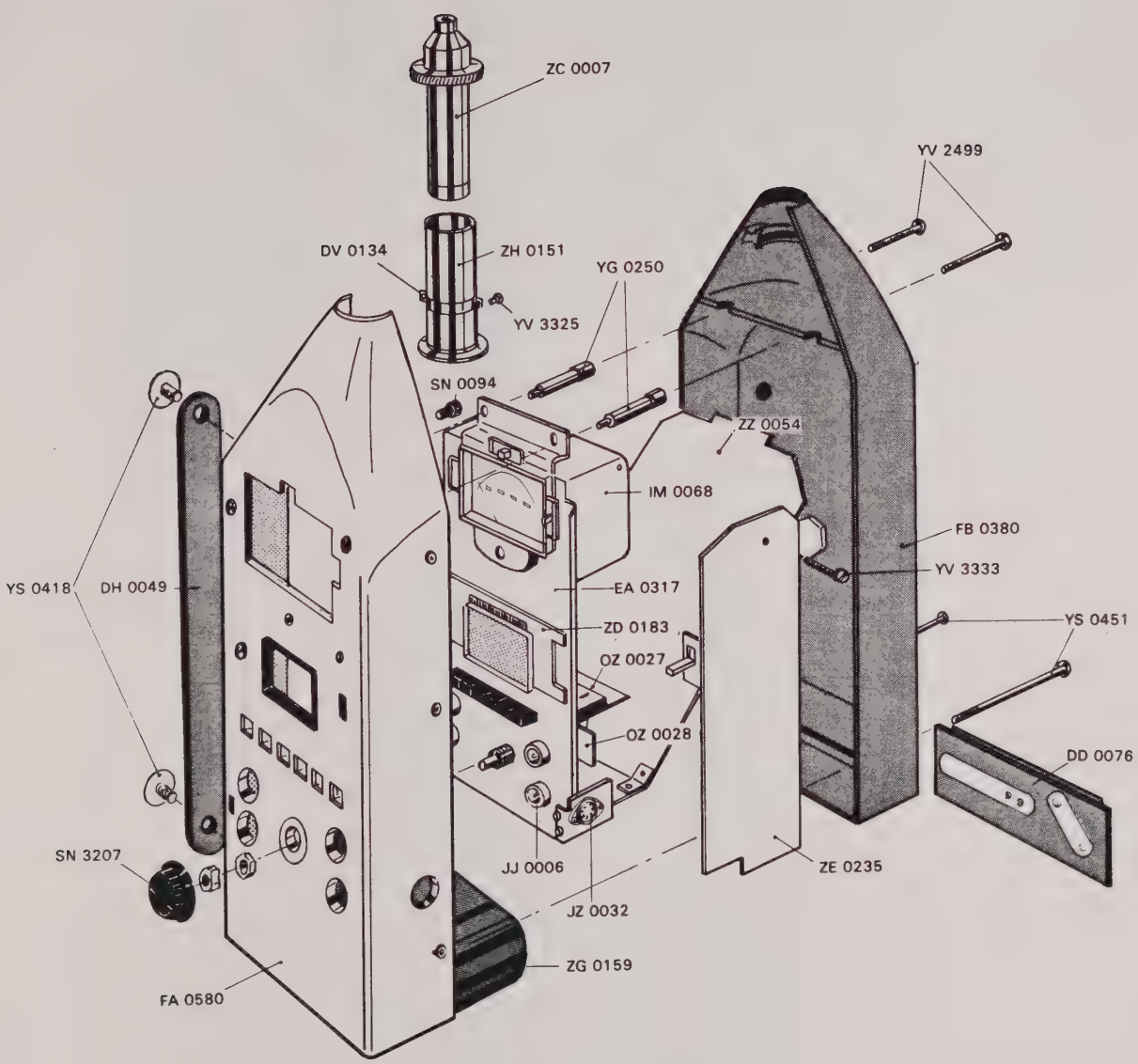
Q 300,301	Si.	1N4148	75 V/75 mA	QV 0216
Q 302	Ge.	AA119	45 V/100 mA	QV 0079
Q 303-307	Si.	1N4148	75 V/75 mA	QV 0216
Q 309-313	-	1N4148	75 V/75 mA	QV 0216
Q 314	LED	TIL209		QV 4000
Q 315	Si.	1N4148	75 V/75 mA	QV 0216
Q 316,317	-	BA158	600 V/5 mA	QV 0245
Q 318,319	Ge.	OA47	25 V/110 mA	QV 0094
Q 320	Ze.	ZPD6,2	5,9-6,5 V/0,25 W	QV 1334
Q 321	-	OF112	210-230 V/0,25 W	QV 1326
Q 322	Ze.	1N4567	6,1-6,7/0,25 W	QV 0037
Q 323,324	Si.	BAX16	150 V/300 mA	QV 0217

R 300	Carbon	1/4 W	5%	39 kΩ	RB 4390
R 301	-	-	-	4,7 kΩ	RB 3470
R 303	Metal	-	1%	49,9 kΩ	RF 4499
R 304	Carbon	-	5%	100 kΩ	RB 5100
R 305	-	-	-	330 kΩ	RB 5330
R 306-308	-	-	-	100 kΩ	RB 5100
R 310	-	-	-	39 Ω	RB 1390
R 311	-	-	-	12 kΩ	RB 4120
R 312	-	-	-	47 kΩ	RB 4470
R 313	-	-	-	1 kΩ	RB 3100
R 314	-	-	-	390 Ω	RB 2390
R 315	-	-	-	6,8 kΩ	RB 3680
R 316	-	-	-	120 Ω	RB 2120
R 317	-	-	-	8,2 kΩ	RB 3820
R 318	-	-	-	1,8 kΩ	RB 3180

CIRCUIT DIAGRAM REF.	COMPONENT TYPE				STOCK REF.
R 319	Carbon	1/4 W	5%	220 Ω	RB 2220
R 320	-	-	-	47 kΩ	RB 4470
R 321	-	-	-	47 Ω	RB 1470
R 322	-	-	-	22 kΩ	RB 4220
R 323	-	-	-	470 kΩ	RB 5470
R 324	-	-	-	10 MΩ	RB 7100
R 325	-	-	-	27 kΩ	RB 4270
R 326	-	-	-	39 kΩ	RB 4390
R 327	-	-	-	27 kΩ	RB 4270
R 328	-	-	-	8,2 kΩ	RB 3820
R 329,330	-	-	-	820 Ω	RB 2820
R 331,332	-	-	-	3,3 kΩ	RB 3330
R 333	Metal	-	1%	2 kΩ	RF 3200
R 334	-	-	-	3,16 kΩ	RF 3316
R 335	-	-	-	56,2 kΩ	RF 4562
R 336,337	-	-	-	40 kΩ	RF 7007
R 338	Carbon	-	5%	5,6 kΩ	RB 3560
R 339	-	-	-	33 kΩ	RB 4330
R 340	-	-	-	4,7 kΩ	RB 3470
R 341	-	-	-	10 kΩ	RB 4100
R 342	-	-	-	15 kΩ	RB 4150
R 343	-	-	-	3,3 MΩ	RB 6330
R 344	-	-	-	10 MΩ	RB 7100
R 345	-	-	-	1 MΩ	RB 6100
R 346-351	-	-	-	100 kΩ	RB 5100
R 352-365	-	-	-	47 kΩ	RB 4470
R 370	-	-	-	100 MΩ	RH 0909

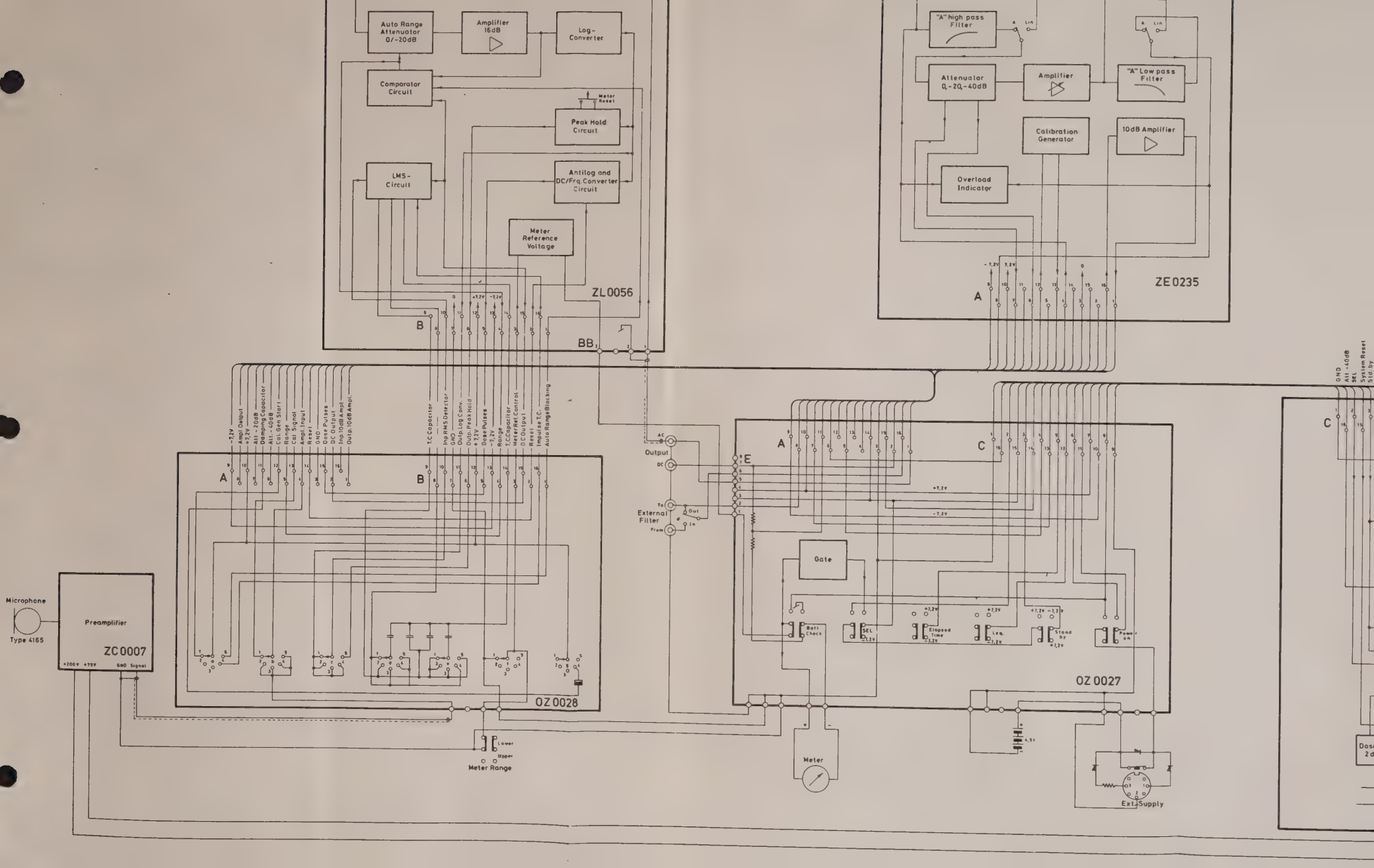
T 300	Converter Coil		LB 0913
V 300	Leq Calculator	TMS1000	VP 0001
V 301-303	Decade Counter	MC1453CL	VD 2042
V 304-306	4 × Bilateral Switch	CD4066A	VD 2008
V 307	Clock Generator	4060	VD 2064
V 308	2 × 4 bit Up Counter	CD4518B	VD 2036
V 309	4 × 2 Input NAND	DC4011A	VD 2004
V 310	4 × 2 Input AND	CD4081B	VD 2065
V 311	6 × Schmitt Trigger	74C14	VD 2033
V 312	2 × D-Flip-Flop	CD4013A	VD 2006
V 313	4 × 2 Input NAND	CD4011A	VD 2004
V 314	Optically Coupled Isolator.	TIL112	VD 0088
V 315	Silicon NPN	BC182B	VB 0055
V 320-322	- PNP	BC212B	VB 0049
V 323,324	- NPN	BC182B	VB 0055
V 325	- NPN	BD435	VB 0557
V 326,327	- NPN	BF337	VB 0545
V 328,329	- NPN	BC182B	VB 0055
V 330	- PNP	BC212B	VB 0049
V 331,332	Op. Amp.	LM308N	VE 0046

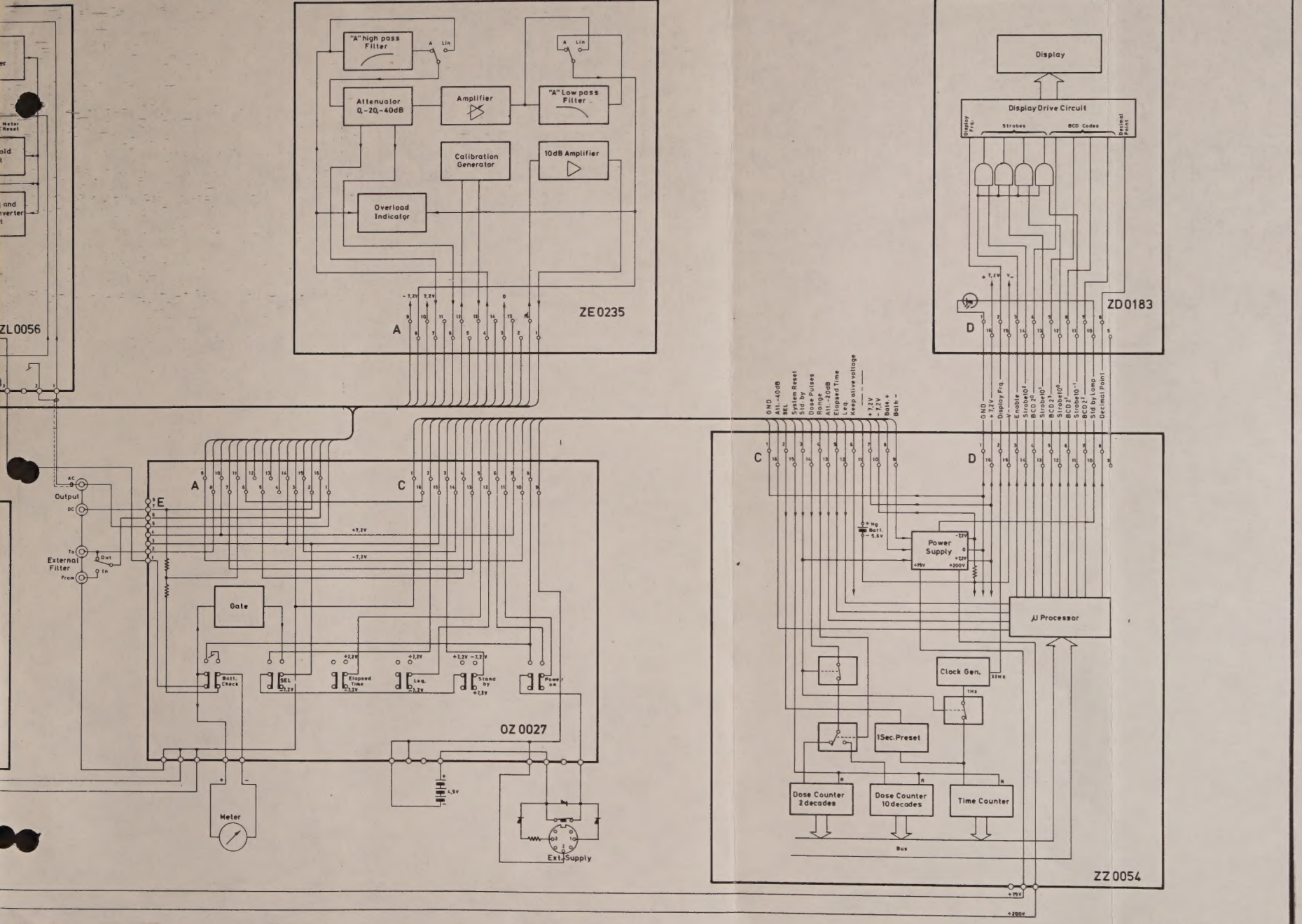
8-pin Socket for dual in line	JJ 0804
12-pin Socket for dual in line	JJ 1213
14-pin Socket for dual in line	JJ 1408
14-pin Socket for dual in line	JJ 1411
16-pin Socket for dual in line	JJ 1622
24-pin Socket for dual in line	JJ 2406
Socket for transistor	JV 0300
Mercury Battery	QB 0019
Printed Circuit Board	XC 1366


ZC 0007
YV 2499
DV 0134
ZH 0151
YG 0250
YV 3325
SN 0094
ZZ 0054
IM 0068
FB 0380
YS 0418
DH 0049
EA 0317
YV 3333
YS 0451
ZD 0183
OZ 0027
OZ 0028
DD 0076
SN 3207
JJ 0006
ZE 0235
JZ 0032
ZG 0159
FA 0580

CIRCUIT DIAGRAM REF.	COMPONENT TYPE				STOCK REF.
Q 410	Si.	1N4004		400 V/1 A	QV 0237
Q 411	"	1N5817		20 V/1 A	QV 5004
Q 412	"	1N4004		400 V/1 A	QV 0237
R 422	Wire	4 W	10%	27 Ω	RX 0325

Holder for plug	DB 0961
8-pin Socket	JJ 0811
Input Adaptor	JJ 2615
"Ext. Filter" and "Output" plug	JP 0006
7-pin DIN Plug	JP 0703
Isolator with plug	JY 0004
Selector	NN 0074
Switch, "Ext. Filter"	NN 0088
Flexible Extension Rod	UA 0196
Wind Screen	UA 0237
Adj. Screw Driver	QA 0001
Batteries	QB 0004
Mercury Battery	QB 0019
Leq Calculator	VP 0001
P. C. Board without comp.	XC 1486
P. C. Board without comp.	XC 1367
P. C. Board with comp.	ZH 0151
Microphone	4165


Auto Range Attenuator 0/-20dB
Amplifier 16dB
Log-Converter
Comparator Circuit
Meter Reset
Peak Hold Circuit
LMS-Circuit
Antilog and DC/Frq. Converter Circuit
Meter Reference Voltage
ZL0056
"A" high pass Filter
Attenuator 0,-20,-40dB
Amplifier
"A" Low pass Filter
Calibration Generator
10dB Amplifier
Overload Indicator
ZE0235
Output
AC
DC
External Filter
To
From
Out
In
Gate
Batt Check
SEL
Elapsed Time
Leq
Stand by
Power on
OZ0027
OZ0028
Microphone
Type 4165
Preamplifier
ZC0007
+200V
+15V
GND
Signal
Lower
Upper
Meter Range
Meter
Ext. Supply


"A" high pass Filter
A Lin
Attenuator 0,-20,-40dB
Amplifier
"A" Low pass Filter
Calibration Generator
10dB Amplifier
Overload Indicator
ZE0235
Display
Display Drive Circuit
Strobes
BCD Codes
ZD0183
ZL0056
Output
External Filter
Gate
OZ0027
Meter
Ext.Supply
Power Supply
µJ Processor
Clock Gen.
1Sec.Preset
Dose Counter 2 decades
Dose Counter 10 decades
Time Counter
Bus
ZZ0054

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